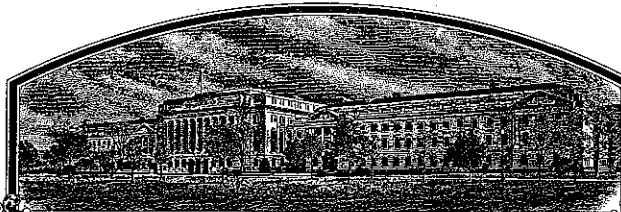


No.

200300066



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

University of Arkansas Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

RICE

'Francis'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this eleventh day of March, in the year two thousand and five.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

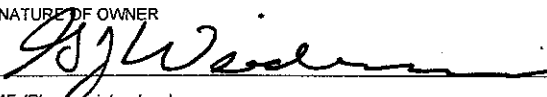
Secretary of Agriculture



U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICEAPPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER University of Arkansas Agricultural Experiment Station		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME RU9901081		3. VARIETY NAME Francis	
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) AFLS Building Room E108 University of Arkansas Fayetteville, AR 72701 USA		5. TELEPHONE (include area code) 501-575-4446		PVPO NUMBER 200300066	
		6. FAX (include area code) 501-575-2401			
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) Land Grant University		8. IF INCORPORATED, GIVE STATE OF INCORPORATION		9. DATE OF INCORPORATION Dec 18, 2002	
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) Karen A.K. Moldenhauer University of Arkansas RREC PO Box 351 2900 Hwy. 130 E. Stuttgart, AR 72160				FILING AND EXAMINATION FEES: \$ 2705- DATE 12/18/2002 CERTIFICATION FEE: \$ 432.00 DATE 10-14-04	
11. TELEPHONE (include area code) 870-673-2661		12. FAX (include area code) 870-673-4315		13. E-MAIL kmolden@uark.edu	
14. CROP KIND (Common Name) Rice		15. GENUS AND SPECIES NAME OF CROP Oryza sativa L.		16. FAMILY NAME (Botanical) RAD 9/16/04	
17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse) a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,705), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)			
19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act <input type="checkbox"/> YES (If "yes", answer items 20 and 21 below) <input checked="" type="checkbox"/> NO (If "no", go to item 22)		20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? IF YES, WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED			
21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? IF YES, SPECIFY THE <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED NUMBER 1,2,3, etc. (If additional explanation is necessary, please use the space indicated on the reverse.)		22. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)			
23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input checked="" type="checkbox"/> YES Plan to apply for patent <input type="checkbox"/> NO RAD 9/28/04 IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)		24. The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.			
SIGNATURE OF OWNER 		SIGNATURE OF OWNER			
NAME (Please print or type) Greg Weidmann		NAME (Please print or type)			
CAPACITY OR TITLE Director, Ark. AES		DATE 12/8/02		CAPACITY OR TITLE	
				DATE	

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be received in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to reproduce the variety, or for tuber reproduced varieties verification that a viable (in the sense that it will reproduce an entire plant) tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for \$2,705 (\$320 filing fee and \$2,385 examination fee), payable to "Treasurer of the United States" (See Section 97.6 of the Regulations and Rules of Practice.) Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfilled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. **Retain one copy for your files.** All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$320 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office

Telephone: (301) 504-5518

FAX: (301) 504-5291

Homepage: <http://www.ams.usda.gov/science/pvpo/pvp.htm>

ITEM

- 18a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method; (2) the details of subsequent stages of selection and multiplication; (3) evidence of uniformity and stability; and (4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified
- 18b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
- (1) identify these varieties and state all differences objectively;
 - (2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
 - (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 18c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 18d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 18e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
19. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. (See Regulations and Rules of Practice, Section 97.103).
22. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.
23. See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.

21. CONTINUED FROM FRONT (Please provide a statement as to the limitation and sequence of generations that may be certified.)

~~22. CONTINUED FROM FRONT (Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)~~

Foundation grade seed of this variety was sold for the purpose of Registered grade seed production on March 6, 2002

23. CONTINUED FROM FRONT (Please give the country, date of filing or issuance, and assigned reference number if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)

A plant utility patent application will be filed.

US Utility Patent filed on
Feb 28, 2003, serial no. 10/377,311.

RAO

9/28/04

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. There is no charge for filing a change of address. The fee for filing a change of ownership or assignment or any modification of owner's name is specified in Section 97.175 of the regulations. (See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center--East, Beltsville, MD 20705. Telephone: (301) 504-8089. <http://www.ams.usda.gov/lsg/seed.htm>

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 3.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotope, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call 202-720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

S&T-470 (07-01) designed by the Plant Variety Protection Office with WordPerfect 9.0. Replaces STD-470 (04-01) which is obsolete.

EXHIBIT A - ORIGIN AND BREEDING HISTORY

'Francis' originated from the cross 'Lebonnet'/CI9902/3/'Dawn'/CI9695// 'Starbonnet' /4/'LaGrue' (cross no.19930887), made at the Rice Research and Extension Center, Stuttgart, AR, in 1993. Overall variety development is described in Table 1.

PARENTAGE.

- Lebonnet released in 1974, is a large kernel, long-grain rice cultivar described by Bollich et al.1975.
- CI 9902 is a short stature, lodging resistant, rice blast resistant, long-grain selection developed at Crowley, and has the pedigree 'Dawn'/245717/3/13-D// 'Rexoro'/Red rice.
- Dawn is a blast resistant, long-grain gold hulled cultivar widely used in crosses which was described by Bollich et al. in 1968.
- CI9695 has the pedigree CI9453/CI9187// 'Bluebonnet 50'.
- Starbonnet is a long grain variety described by Johnston et al. 1968.
- LaGrue is a high-yielding long-grain rice described by Moldenhauer et al. 1994.

EVALUATION

The experimental designation for early evaluation of Francis was STG96L05-077, starting with a bulk of F_6 seed from the 1996 panicle row L05-077. Francis was tested in the Arkansas Rice Performance Trials (ARPT) and the Cooperative Uniform Regional Rice Nursery (URRN) during 1999-2001 as entry RU9901081 (RU number indicates Cooperative Uniform Regional Rice Nursery; 99 indicates year entered; 01 indicates Stuttgart, AR; and 081 its entry number).

Francis was developed through a modification involving a variety of plant breeding methods including pedigree, bulk, and single panicle decent.

Francis appears to be uniform and stable in the F_{10} generation. For the last three years, head row through foundation seed fields (F_8 - F_{10}), Francis has remained uniform and stable. Some short tip awns may be present on the lemma at maturity under conditions of high fertility. Less than .02% of plants (1 in 5000), overall, have been rogued from the foundation seed fields of Francis. These include the following: taller plants, shorter plants, earlier plants, later plants, lighter green and or pubescent plants, as well as intermediate grain types, very-long slender grain types and grains with long awns. All of these variants are easily visually identified in the field

Table 1. Development of Francis

Year	Program Stage
2001	Arkansas Rice Performance Trials (4 loc) and URRN (5 loc) 16 acre Foundation Seed Field (rough rice and milling yields, height, maturity, straw strength, disease resistance and physiological disorder straight head)
2000	Arkansas Rice Performance Trials (4 loc) and URRN (4 loc) 1000 Head rows Stuttgart Arkansas (rough rice and milling yields, height, maturity, straw strength, disease resistance and physiological disorder straight head)
1999	Arkansas Rice Performance Trials (4 loc) and URRN (4 loc) (rough rice and milling yields, height, maturity, straw strength, disease resistance and physiological disorder straight head)
1998	Stuttgart Initial Test (2 locations) (preliminary information on rough rice and milling yields, height, maturity, straw strength, and disease resistance)
1997	Preliminary Trials (1 location) (preliminary information on milling yields, height, maturity, and straw strength)
1996	F ₅ Panicle row (single row) STG96L-05-077
1995	F ₄ Panicle row (single row)
1994-95 (winter)	F ₃ Panicle row (single row), Puerto Rico
1994	F ₂ field
1993-94	F ₁ Greenhouse, Stuttgart, AR
1993	Crossing (19930887)

EXHIBIT B - STATEMENT OF DISTINCTNESS

Francis is most similar to the variety Wells. Unlike Wells however, Francis is susceptible to the blast races IB-54 and IG-1 with a greenhouse disease ratings of 6 and 6, respectively compared to ratings of 0 and 2, respectively for Wells (Table A additional data). Francis is very susceptible to kernel smut unlike Wells which is moderately resistant to kernel smut. Francis has a smaller seed size than Wells see Table B and C below.

Francis has a smaller kernel size than Millie (Table B and C). We went back to seed samples from 2000-2002 from the Stuttgart Initial Test (a two replication test grown at 2 locations) and pulled samples from the Rice Research and Extension Center location which we analyzed for seed size.

MATURITY: Francis heads 84 days after emergence, and is similar in maturity to 'Cocodrie' and Wells.

STRAW STRENGTH: Straw strength is an indicator of lodging resistance. Francis, like 'Ahrent', LaGrue, and 'Wells', has greater straw strength than 'Kaybonnet' or 'Drew'. On a relative straw strength scale (0 = very strong straw, 9 = very weak straw) Francis, Ahrent, Wells, LaGrue, Drew, Kaybonnet, and Cocodrie rated 3, 3, 3, 3, 4, 4, and 2, respectively.

PLANT HEIGHT: Francis is 100 cm in plant height which is 10 to 13 cm shorter than LaGrue, and between the height of Cocodrie and Wells which are 98 and 104 cm, respectively.

ROUGH RICE GRAIN YIELD: Francis has consistently ranked as one of the highest yielding varieites in the Arkansas Rice Performance Trials (ARPT). Yields have being either equal to or greater than those of LaGrue and Wells in all three years. In 14 ARPT tests (1999-2001), Francis, Ahrent, Wells, LaGrue, Kaybonnet, Drew, Cypress, and Cocodrie averaged yields of 9374, 8618, 9122, 8870, 8014, 8164, 7459, and 8518 kg ha⁻¹ (at 120 g kg⁻¹ (12%) moisture), respectively. Data from the URRN conducted at Arkansas, Louisiana, Mississippi, and Texas during 1999 - 2001 showed that Francis yielded 11,239 kg ha⁻¹, comparing favorably with Ahrent, Wells, LaGrue, Drew, Kaybonnet, Cocodrie, and Cypress at 8921, 10,231, 10,483, 9274, 9526, 9626, and 8669 kg ha⁻¹, respectively.

MILLING YIELD: Milling yields (mg g⁻¹ whole kernel:mg g⁻¹ total milled rice) at 120 mg g⁻¹ moisture from the ARPT, 1999-2001, averaged 630:710 for Francis, and 620:680, 580:720, 590:690, 610:700, 610:710, 650:710, and 650:700 for Ahrent, Wells, LaGrue, Kaybonnet, Drew, Cocodrie, and Cypress, respectively. Milling yields for the URRN during the same period of time, 1999 - 2001, averaged 580:690 for Francis, and 550:680, 550:700, 560:680, 610:690, 610:690, 610:690, and 630:690 for Ahrent, Wells, LaGrue, Kaybonnet, Drew, Cocodrie, and Cypress, respectively.

DISEASE RESISTANCE

BLAST: Francis, like LaGrue, is susceptible to currently prevalent blast (*Pyricularia grisea* (Cooke) Sacc.) races IB-1, IB-49, IB-54, and IC-17 with summary ratings in greenhouse tests of 4, 5-6, 6, 5-6 respectively (standard disease scale of 0 = immune, 9 = maximum disease susceptibility). Francis is also susceptible to IG-1 with a rating of 4-6, but resistant to IH-1 with a rating of 0-1. Francis, Lagrue, and Wells are rated S, and are more susceptible than Cocodrie (MS) and Cypress (MR).

SHEATH BLIGHT: Francis is rated MS to sheath blight (*Rhizoctonia solani* Kühn) as are other Arkansas cultivars (Ahrent, Wells, LaGrue, Kaybonnet, and Drew). These are all less susceptible than Cypress (VS) and Cocodrie (VS).

KERNEL SMUT: Francis is rated VS for kernel smut (*Tilletia barclayana* (Bref.) Sacc. & Syd. in Sacc.) as are Lagrue, Cypress, and Cocodrie. Wells is more resistant (MR).

STEM ROT: Francis is rated S to stem rot (*Sclerotium* spp.), as are Cocodrie and Ahrent. Less susceptible are Cypress and Wells (MS).

BROWN SPOT: Francis is rated R to brown spot (*Cochliobolus miyabeanus* (Ito & Kuribayashi in Ito) Drechs. ex Dastur).

NARROW BROWN LEAF SPOT: Francis is rated R to narrow brown leaf spot (*Cercospora oryzae* Miyake), as are Ahrent, Cocodrie, Cypress, and Wells.

FALSE SMUT: Francis is rated S to false smut (*Ustilaginoidea virens* (Cooke) Takah), as are Ahrent, Cocodrie, Cypress, and Wells.

INSECT RESISTANCE: Francis, like LaGrue is susceptible for discolored kernels caused by the rice stink bug (*Oebalus pugnax*).

KERNEL CHARACTERISTICS

KERNEL WEIGHT: Individual milled kernel weights of Francis, Ahrent, Wells, LaGrue, Kaybonnet, Drew, Cypress, and Cocodrie, averaged 16.5, 16.5, 18.8, 17.8, 14.7, 16.1, 17.4, and 17.6, respectively, in the ARPT, 1999 - 2001.

KERNEL SIZE: Kernels are similar in size to those of Ahrent and Drew.

ENDOSPERM: Francis is nonglutinous, nonaromatic, and covered by a light brown pericarp, typical of southern US long grains.

CHEMICAL QUALITY: Francis has typical southern U.S. long-grain rice cooking quality characteristics as described by Webb et al. (4). Francis has an average apparent starch amylose content of 212 g kg⁻¹ and an intermediate gelatinization temperature (70 - 75° C), as indicated by an average alkali (17 g kg⁻¹ KOH) spreading reaction of 3 to 5.

Table A. Summary leaf blast reactions in Francis and reference cultivars when inoculated with *Pyricularia grisea* races in Texas. This is additional data not included in the original document.

Texas 1999										
Cultivar	1B-1	IB-17	IB-45	IB-49	IB-54	IC-17	IE-1	IE-1k	IG-1	IH-1
Francis	4	4	5	6	6	5	5	6	6	1
Wells	8	7	1	8	0	5	6	5	1	2
Ahrent	3	1	1	2	0	1	1	5	1	1
LaGrue	6	7	4	8	7	5	4	5	6	6
Kaybonnet	4	1	1	3	0	1	4	4	1	1
Texas 2000										
Francis	4	5		5	6	6		7	7	0
Wells	4	6		6	0	6		6	2	1
Ahrent	1	0		1	0	3		4	3	0
LaGrue	5	5		6	8	5		7	7	5
Kaybonnet	1	2		1	1	3		8	2	1
Texas 2001										
Francis				5	7	8		8	5	
Wells				6	0	8		4	1	
Ahrent				0	0	0		4	0	
LaGrue				7	6	7		8	7	
Kaybonnet				1	0	1		6	2	
Texas 2002										
Francis				8	5	8		6	6	
Wells				8	0	8		6	3	
Ahrent				0	0	0		8	0	
LaGrue				5	6	8		7	5	
Kaybonnet				0	0	0		8	0	

^a Composite leaf blast ratings on the 0 (none) -9 (maximum) disease scale in multiple comparative inoculated greenhouse tests conducted by Dr. M.A. Marchetti, USDA, Beaumont, Texas. Ratings indicate relative susceptibility under conditions favorable for seedling blast.

^b Disease ratings vary between tests. For conversion of the 0-9 disease scale to symbols R (resistant) = 0-3, MR (moderately resistant) = 3-4, MS (moderately susceptible) = 5-6, S (susceptible) = 7, and VS (very susceptible) = 8-9. Varieties rated MS may be damaged and those rated S or VS may be severely damaged under favorable blast conditions.

Table. Summary leaf blast reactions in Francis and reference cultivars inoculated with races of *Pyricularia grisea* in greenhouse tests.

Cultivar	Test period	International Blast Race ^a							
		IB-1	IB-33	IB-49	IB-54	IC-17	IE-1K	IG-1	IH-1
Francis	1999-2000	4		5-6	6	5-6	6-7	4-6	0-1
Ahrent	1998-2000	1-3	5-7	0-2	0	1-3	4-7	0	0
Drew	1998-2000	0-1	4-7	0-3	1	0-2	5-7	0	0
Cypress	1998-2000	6	5-7	7	1	6-7	5-7	0	0
Cocodrie	1998-2000	3-6	4-7	5-7	0	6-7	5-6	0	0-1
LaGrue	1998-2000	6	6	6-8	7-8	5-8	6-7	7	6-7
Wells	1998-2000	6-7	5-7	7-8	0	6-7	6-8	0	0
Jefferson	1998-2000	5	5-7	5-8	1	0-1	0-1	0-1	0-1

^a

Pyricularia grisea races as defined using the international set of blast differentials. Composite leaf blast ratings on the 0 (none) -9 (maximum) disease scale in multiple comparative inoculated greenhouse tests conducted at the University of Arkansas Rice Research and Extension Center, Stuttgart, Arkansas and by Dr. M.A. Marchetti, USDA, Beaumont, Texas.

Ratings indicate relative susceptibility under conditions favorable for seedling blast.

^b Disease ratings vary between tests. For conversion of the 0-9 disease scale to symbols R (resistant) = 0-3, MR (moderately resistant) = 3-4, MS (moderately susceptible) = 5-6, S (susceptible) = 7, and VS (very susceptible) = 8-9. Varieties rated MS may be damaged and those rated S or VS may be severely damaged under favorable blast conditions.

Table . Rice variety reactions¹ to diseases (2001).

Variety	Sheath Blight	Blast	Stem Rot	Kernel Smut	False Smut	Brown Spot	Straight head	Lodging
Ahrent	MS	R	S	MS	S	R	MS	MS
Cocodrie	VS	MS	S	VS	S	R	VS	R
Cypress	VS	MR	MS	VS	S	R	MS	MR
Drew	MS	R	MS	MS	S	S	MS	MS
Katy	MS	R	MS	R	MR	R	S	MS
Kaybonnet	MS	R	MS	MS	S	S	S	MS
LaGrue	MS	S	MS	VS	S	R	MS	MS
Wells	MS	S	MS	MR	S	R	MS	MS
Francis	MS	S	S	VS	S	R	MS	MS

¹ Abbreviations: R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible; VS = very susceptible.

Table prepared by R.D. Cartwright and F.N. Lee.

20 0300066

TABLE B. Sample Kernel measurements from the Stuttgart Initial Test, Stuttgart location 2001

VARIETY	CLASS	LENGTH mm	WIDTH mm	THICKNESS	L/W RATIO
Francis	ROUGH	8.56	2.54	1.91	3.37
Ahrent	ROUGH	8.46	2.40	1.91	3.53
Millie	ROUGH	9.65	2.53	1.97	3.81
Wells	ROUGH	9.21	2.42	1.80	3.81
C.V. (.05)		0.52	0.04		
Francis	BROWN	6.47	2.09	1.76	3.10
Ahrent	BROWN	6.29	2.03	1.72	3.10
Millie	BROWN	7.45	2.21	1.73	3.37
Wells	BROWN	7.33	2.13	1.65	3.44
C.V. (.05)		0.11	0.03		
Francis	MILLED	6.30	2.04	1.66	3.09
Ahrent	MILLED	6.21	1.97	1.64	3.15
Millie	MILLED	7.13	2.19	1.70	3.26
Wells	MILLED	6.94	2.07	1.51	3.35
C.V. (.05)		0.12	0.04		

RAP
9/13/04

20 0300066

TABLE C. Sample Kernel measurements from the Stuttgart Initial Test, Stuttgart location 2002

VARIETY	CLASS	LENGTH _{mm}	WIDTH _{mm}	THICKNESS	L/W RATIO
Francis	ROUGH	8.66	2.52	1.94	3.44
Ahrent	ROUGH	8.36	2.25	1.95	3.72
Millie	ROUGH	9.71	2.56	2.01	3.79
Wells	ROUGH	9.31	2.47	1.90	3.77
C.V. (.05)		0.13	0.06		
Francis	BROWN	6.58	2.08	1.78	3.16
Ahrent	BROWN	6.32	2.03	1.74	3.11
Millie	BROWN	7.52	2.25	1.82	3.34
Wells	BROWN	7.30	2.10	1.65	3.48
C.V. (.05)		0.12	0.03		
Francis	MILLED	6.34	2.05	1.68	3.09
Ahrent	MILLED	6.27	1.99	1.66	3.15
Millie	MILLED	7.22	2.20	1.70	3.28
Wells	MILLED	6.99	2.07	1.60	3.38
C.V. (.05)		0.12	0.05		

RAP
9/13/04

U.S. DEPARTMENT OF AGRICULTURE
PLANT VARIETY PROTECTION OFFICE, AMS, USDA
NATIONAL AGRICULTURAL LIBRARY Bldg., Rm. 500
10301 BALTIMORE Blvd.
BELTSVILLE, MD 20705

OBJECTIVE VARIETY DESCRIPTION
RICE (*Oryza sativa*)

20 030 00 66

Name of Applicant(s) Karen A. K. Moldenhauer	Temporary Designation RU9901081	Variety Name FRANCIS
Address (Street and No. or R.F.D. No., City, State, and Zip Code) University of Arkansas Rice Research and Extension Center PO BOX 351 Stuttgart, AR 72160		<div style="border: 1px solid black; padding: 2px; font-size: small;">FOR OFFICIAL USE ONLY</div> PVPO Number

Place the appropriate number that describes the character of this variety in the spaces provided below. These numbers are also code numbers corresponding to descriptors developed by IBGR-IRRI Rice Advisory Committee and the US Rice Crop Advisory Committee. Breeders will demonstrate novelty more readily by describing as many characters as is possible.

1. MATURITY - Days to Heading (Seeding to 50% Heading):

- A. South: (Location: Stuttgart, AR) at _____ kg/ha (Nitrogen rate)
- 84 Number of days
- 1 Days earlier than Check variety: Wells
- Days same as Check variety: Cocodrie
- 1 Days later than Check variety: Ahrent
- 1 Maturity Class (50% heading) - South: 1 = Very early (less than 86 days) 2 = Early (86 - 100)
- 3 = Intermediate (101 - 115) 4 = Late (more than 115)
- B. California: (Location: _____) at _____ kg/ha (Nitrogen rate)
- _____ Number of days
- _____ Days earlier than Check variety: _____
- _____ Days same as Check variety: _____
- _____ Days later than Check variety: _____
- _____ Maturity Class (50% heading) - California: 1 = Very early (less than 91 days) 2 = Early (91 - 97)
- 3 = Intermediate (98 - 104) 4 = Late (more than 104 days)

2. CULM:

- 1 ANGLE (Degrees from Perpendicular after Flowering:
- 1 = Erect (less than 30°) 3 = Intermediate (about 45°) 5 = Open (about 60°)
- 7 = Spreading (more than 60° but the culms do not rest on the ground)
- 9 = Procumbent (the culm or its lower part rests on the ground surface)

2. CULM: (continued)

LENGTH

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1 0 0 0 cm (Soil level to top of extended panicle on main stem)

5 cm Shorter than Check variety: Wells

Length same as Check variety: _____

2 5 cm Longer than Check variety: Cocodrie

2 HEIGHT CLASS: 1 = Semidwarf 2 = Short 3 = Medium 4 = Tall

1 INTERNODE COLOR (After flowering): 1 = Green 2 = Light Gold 3 = Purple lines 4 = Purple

1 STRENGTH (Lodging resistance): 1 = Strong (no lodging) 3 = Moderately strong (most plants leaning)
5 = Intermediate (most plants lodged) 7 = Weak (most plants flat)
9 = Very weak (all plants flat)

3. FLAG LEAF (After Heading):

3 0 cm LENGTH (range 18 - 40) 1 6 5 mm WIDTH (range 12 - 20)

1 PUBESCENCE: 1 = Glabrous 2 = Intermediate 3 = Pubescent

3 LEAF ANGLE (after heading): 1 = Erect 3 = Intermediate 5 = Horizontal 7 = Descending

3 BLADE COLOR: 1 = Pale Green 2 = Green 3 = Dark Green 4 = Purple tips
5 = Purple margins 6 = Purple blotch 7 = Purple

1 BASAL LEAF SHEATH COLOR: 1 = Green 2 = Purple lines 3 = Light purple 4 = Purple

4. LIGULE:

3.4 mm LENGTH (from base of collar to the tip, at late vegetative stage)

4 COLOR (Late vegetative state): 1 = White 2 = Purple lines 3 = Purple 4 = pale green

2 SHAPE: 1 = Acute to acuminate 2 = 2-Cleft 3 = Truncate

1 COLLAR COLOR (late vegetative stage): 1 = Pale green 2 = Green 3 = Purple

1 AURICLE COLOR (late vegetative stage): 1 = Pale green 2 = Purple

5. PANICLE:

22.6 cm LENGTH (range 18 - 27)

5 TYPE: 1 = Compact 5 = Intermediate 9 = Open

3 SECONDARY BRANCHING: 1 = Absent 2 = Light 3 = Heavy 4 = Clustering

2 EXsertION (near maturity): 1 = Less than 90% 2 = 90 - 99% 3 = 100% exserted

2 AXIS: 1 = Straight 2 = Droopy

3 SHATTERING: 1 = Very low (less than 1%) 3 = Low (1 - 5%) 5 = Moderate (6 - 25%)
7 = Moderately high (26 - 50%) 9 = High (more than 50%)

2 THRESHABILITY: 1 = Difficult 2 = Intermediate 3 = Easy

6. GRAIN (Spikelet):

20 0300066

- 0 AWNS (after full heading): 0 = Absent 1 = Short and partly awned 5 = Short and fully awned
7 = Long and partly awned 9 = Long and fully awned
- 3 APICULUS COLOR (at maturity): 1 = White 2 = Straw 3 = Brown (tawny) 4 = Red
5 = Red apex 6 = Purple 7 = Purple apex
- 1 STIGMA COLOR: 1 = White 2 = Light green 3 = Yellow 4 = Light purple 5 = Purple
- 0 LEMMA AND PALEA COLOR (at maturity):
0 = Straw 1 = Gold and/or gold furrows on straw background 2 = Brown spots on straw (piebald)
3 = Brown furrows on straw 4 = Brown (tawny) 5 = Reddish to light purple
6 = Purple spots on straw 7 = Purple furrows on straw 8 = Purple
9 = Black 10 = White
- 1 LEMMA AND PALEA PUBESCENCE: 1 = Glabrous 2 = Hairs on lemma keel 3 = Hairs on upper portion
4 = Short hairs 5 = Long hairs (velvety)
- 1 SPIKELET STERILITY (at maturity): 1 = Highly fertile (>90%) 3 = Fertile (75-90%) 5 = Partly sterile (50-74%)
7 = Highly sterile (<50% to trace) 9 = Completely sterile (0%)

7. GRAIN (Seed):

- 2 SEED COAT (bran) COLOR: 1 = White 2 = Light brown 3 = Speckled brown 4 = Brown
5 = Red 6 = Variable purple 7 = Purple
- 1 ENDOSPERM TYPE: 1 = Nonglutinous (nonwaxy) 2 = Glutinous (waxy) 3 = Indeterminate
- 1 ENDOSPERM TRANSLUCENCY: 1 = Clear 5 = Intermediate 9 = Opaque
- 1 ENDOSPERM CHALKINESS: 0 = None 1 = Small (less than 10% of sample)
5 = Medium (10-20% of sample) 9 = Large (more than 20% of sample)
- 0 SCENT (Aroma): 0 = Nonscented 1 = Lightly scented 2 = Scented

SHAPE CLASS (length/width ratio):

- 3 PADDY 1 = Short (2.2:1 and less) 2 = Medium (2.3:1 to 3.3:1) 3 = Long (3.4:1 and more)
- 3 BROWN 1 = Short (2.0:1 and less) 2 = Medium (2.1:1 to 3.0:1) 3 = Long (3.1:1 and more)
- 3 MILLED 1 = Short (1.9:1 and less) 2 = Medium (2.0:1 to 2.9:1) 3 = Long (3.0:1 and more)

MEASUREMENTS:

Grain Form	Length (mm)	Width (mm)	Thickness (mm)	L/W Ratio	1000 Grains (grams)
Paddy	<u>8.91</u>	<u>2.50</u>	<u>1.94</u>	<u>3.56</u>	<u>22.3</u>
Brown	<u>6.84</u>	<u>2.19</u>	<u>1.70</u>	<u>3.21</u>	<u>18.3</u>
Milled	<u>6.50</u>	<u>2.04</u>	<u>1.65</u>	<u>3.20</u>	<u>17.7</u>
<u>20</u> Milling quality (% hulls)	<u>63:71</u>		Milling yield (% whole kernel (head) rice to rough rice)		
<u> </u> % Protein	<u>21</u>		% Amylose		

Alkali Spreading value: 1.5% KOH Solution 3-5 1.7% KOH Solution

7. GRAIN (Seed): (continued)

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5 GELATINIZATION TEMPERATURE TYPE: 1 = High 5 = Intermediate 7 = Low

Amylographic Paste Viscosity (Brabender Units)

Peak

Hot Paste

Cooled Paste

'Breakdown' 'Setback'

8. RESISTANCE TO LOW TEMPERATURE:

ND GERMINATION AND SEEDLING VIGOR: 1 = Low 2 = Medium 3 = HighND FLOWERING (Spikelet fertility): 1 = Low 2 = Medium 3 = High

9. SEEDLING VIGOR NOT RELATED TO LOW TEMPERATURE:

2 VIGOR: 1 = Low 2 = Medium 3 = High10. BLAST RESISTANCE (*Pyricularia Oryzae*). (International races found under references)

0 = Immune

1 = Resistant

3 = Moderately resistant

5 = Intermediate

7 = Susceptible

9 = Very Susceptible

Moderately Susceptible

Group	IB					IC		ID		IE	IG	IH
Number	1	5	45	49	54	1	17	1	13	1k	1	1
Resistance	<u>3</u>	<u> </u>	<u> </u>	<u>7</u>	<u>7</u>	<u> </u>	<u>7</u>	<u> </u>	<u> </u>	<u>7</u>	<u>7</u>	<u>1</u>

11. RESISTANCE TO OTHER DISEASES:

0 = Immune

1 = Resistant

3 = Moderately resistant

5 = Intermediate

7 = susceptible

9 = Very Susceptible

Moderately Susceptible

1 Narrow Brown Leaf Spot *Cercospora oryzae*ND Aggregate Sheath Spot *Rhizoctonia oryzae-sativae*ND Leaf Smut *Entyloma oryzae*5 Straight Head1 Brown Leaf Spot *Helminthosporium oryzae*
(= *Bipolaris oryzae*)
(= *Drechslera oryzae*)9 Kernel Smut *Neovossia horrida*
(= *Tilletia barclayana*)ND Leaf Scald *Gerlachia oryzae*ND White Tip Nematode *Aphelenchoides besseyi*ND Hoja Blanca Virus7 Stem Rot *Sclerotium oryzae*ND Sheath Rot *Sarocladium oryzae*ND Pythium Seedling Blight *Pythium* sp.ND Bacterial Blight *Xanthomonas campestris* pv. *oryzae*ND Sheath Spot *Rhizoctonia oryzae*5 Sheath Blight *Rhizoctonia solani*7 Other: False Smut (*Ustilaginoidea virens*)

12. INSECT RESISTANCE:

0 = Immune

1 = Resistant

3 = Moderately resistant

5 = Intermediate

7 = Moderately susceptible

9 = Susceptible

ND Grasshopper9 Rice Stink Bug *Oebalus pugnax*ND Rice LeafhopperND Swarm CaterpillarND Rice HispaND Rice Water Weevil *Lissorhoptrus oryzophilus*ND Rice MidgeND Rice Stalk Borer *Chilo plejadellus*ND Least SkipperND Sugarcane Borer *Diatraea saccharalis*

13. OTHER DESCRIPTORS: If there are other characters that describe this variety, please indicate below:

20 0300066

REFERENCES

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 2. J. G. Atkins *et al.* 1967. An International Set of Rice Varieties for Differentiating Race of *Pyricularia Oryzae*. *Phytopath.* 57:297-301.
 3. IBPGR-IRRI Rice Advisory Committee. 1980. Descriptors for Rice *Oryza sativa* L.). International Rice Research Institute. 21 pp.
 4. K. C. Ling and S. H. Ou, 1969. Standardization of the International Race Numbers of *Pyricularia Oryzae*. *Phytopath.* 59:339-342.
 5. B. D. Webb *et al.* 1985. Utilization Characteristics and Qualities of United States Rice. In Proceedings on Rice Grain Quality and Marketing. International Rice Research Institute (IRRI), Los Banos, Philippines. p. 25-35.
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DISEASE EVALUATIONS OF FRANCIS

Funding to improve and utilize varietal resistance for the control of rice diseases in Arkansas comes almost entirely from grower check-off monies administered by the Rice Research and Promotion Board. These funds are used to monitor and identify diseases in order to establish resource allocation priorities, conduct preliminary research needed to identify and improve genetic resistance sources, support the greenhouse and field diseases on experiment stations and in grower fields, and maintain qualified support staff necessary to incorporate quality disease resistance in new cultivars released for use by Arkansas rice producers.

Varietal resistance is the most efficient and reliable means of controlling rice diseases. Conservation and improvement of disease resistance is a continuous endeavor basic to varietal development. Incorporation of existing and new resistance sources is a complex process limited by several variables. The rice disease research program routinely evaluates breeding program entries to provide disease data required for superior variety development. Our objectives are to increase varietal disease resistance and to define disease liabilities of new varieties released for rice production in Arkansas.

Rice diseases are usually rated visually on a 0-9 scale to estimate degree of severity. Numerical data is often converted to this scale. A rating of zero indicates complete disease immunity. A rating of one to three indicates resistance where little loss occurs and in the case of rice blast pathogen growth is restricted considerably. Conversely, a nine rating indicates maximum disease susceptibility, which typically results in complete plant death and/or yield loss. Depending upon the disease in question, a disease rating of four to six is usually indicative of acceptable disease resistance under conditions slightly favoring the pathogen. Numerical ratings are sometimes converted to letter symbols where 0-3 = R (resistant), 3-4 = MR (moderately resistant), 5-6 = MS (moderately susceptible) 7 = S (susceptible) and 8-9 VS (very susceptible). Exceptions to established ratings do occur unexpectedly as disease situations change.

These data come from several sources. Advanced and promising breeding lines are normally evaluated by researchers in other states. It is not unusual for ratings to vary with location and year due to environmental differences and research procedures. Ratings within a source traditionally have been consistent.

Greenhouse blast tests are the primary means of screening large number of entries for varietal reaction to the many blast races occurring in the production areas. Although results are quite variable and testing conditions tends to overwhelm any field resistance present in the entry, this test provides an accurate definition of the fungus-variety genetics. Blast field nurseries, utilizing both natural and lab produced inoculum, are established in an effort to better define blast susceptibility under field conditions. Since field nursery is also quite variable, new techniques are currently being developed and evaluated to better estimate cultivar field resistance to blast.

Field nurseries are established and artificially inoculated to provide a uniform disease pressure for evaluations under field conditions. Grower nurseries are established operate in an effort to evaluate disease reactions in grower fields under current production practices. Over time these nurseries document variety performance under adverse disease conditions in Arkansas production fields.

DISCOLORED KERNELS

An increasingly important aspect of rice quality is the level of discolored kernels. In the field, kernel discolorations are caused by (1) fungi alone, (2) fungi introduced through feeding probes of insects, and (3) physiological responses to adverse environmental conditions during grain fill see following photograph. Infection by kernel smut, brown spot, or other fungi alone often cause black, brown, red, or pink discolored kernels. Rice stink bug adults and nymphs commonly are found in all Arkansas rice fields and feed on rice kernels at all stages of development except at hard dough and maturity. Very often because the hull is pierced by rice stink bugs fungi gain entry and the infection results in discolored and chalky kernels. Another cause of discolored kernels is apparently physiological and has been called linear discolored kernels. Linear discolored kernels have a straight (linear) 'cut' in the kernel that is surrounded by a dark brown to black area. All agents that discolor rice kernels are commonly found in all Arkansas rice fields. However, local environmental conditions control the level to which any one of the agents infest rice and rice varieties have different levels of susceptibility. Regardless of the cause, discolored kernels are costly to growers and millers.

Percentage, by weight, of damaged kernels in selected entries of the Early Season Maturity Group of the 2000 ARPT. (Average does not include Rowher; Rankings from highest value to lowest)

Rice Stink Bug

Line	Stuttgart	Rowher	Colt	Jackson Co.	Average	Rank
Francis	0.31		0.78	0.39	0.49	23rd
Jefferson	0.47	(9.76)	0.62	0.46	0.52	21st
Maybelle	0.49	(9.60)	0.94	0.51	0.65	17th
Cocodrie	0.68	(16.45)	1.62	0.90	1.07	5th
M202	1.70	(20.54)	2.14	0.90	1.58	2nd
Koshihakari	1.20	(14.09)	3.29	1.11	1.87	1st
XL6	0.39	(14.33)	1.39	0.37	0.72	14th

Kernel Smut

Line	Stuttgart	Rowher	Colt	Jackson Co.	Average	Rank
Francis	0		0	0.422	0.141	6th
Jefferson	0.007		0.004	0.297	0.103	7th
Maybelle	0.009		0.030	0.468	0.169	4th
Cocodrie	0		0	0.305	0.102	8th
M202	0.033		0.031	0.069	0.044	16th
Koshihakari	0		0	0.015	0.005	24th
XL6	0		0.002	0.087	0.030	19th

Other

Line	Stuttgart	Rowher	Colt	Jackson Co.	Average	Rank
Francis	0.228		0.189	0.156	0.191	21st
Jefferson	0.618		0.375	0.369	0.454	8th
Maybelle	0.415		0.279	0.256	0.317	14th
Cocodrie	0.607		0.609	1.051	0.756	6th
M202	4.576		1.088	1.582	2.415	1st
Koshihakari	1.141		1.260	0.569	0.990	3rd
XL6	0.140		0.214	0.144	0.166	20th

Linear

Line	Stuttgart	Rowher	Colt	Jackson Co.	Average	Rank
Francis	0.014		0.011	0.032	0.019	16th
Jefferson	0.027		0.010	0.027	0.021	14th
Maybelle	0.047		0.009	0.018	0.025	13th
Cocodrie	0.051		0.044	0.058	0.051	6th
M202	0.384		0.082	0.185	0.217	4th
Koshihakari	1.443		0.648	0.171	0.754	1st
XL6	0.022		0.018	0.022	0.021	15th

Percentage, by weight, of damaged kernels in selected entries of the Very Short Season Maturity Group of the 1999 ARPT. (Rankings from the highest value to lowest)

Rice Stink Bug

Line	Stuttgart	Rowher	Colt	Jackson Co.	Average	Rank
Francis	1.00	3.81	2.21	0.48	1.87	15th
Millie	1.04	2.95	1.89	0.70	1.64	18th
Jackson	1.06	2.60	1.49	0.42	1.39	25th
Cocodrie	1.54	2.94	2.43	0.70	1.90	14th
Bengal	1.58	5.18	1.58	0.88	2.30	10th

Kernel Smut

Line	Stuttgart	Rowher	Colt	Jackson Co.	Average	Rank
Francis	0.068	0.069	0.109	0.013	0.065	9th
Millie	0.016	0.026	0.051	0.002	0.024	19th
Jackson	0.043	0.045	0.061	0	0.037	13th
Cocodrie	0.041	0.108	0.112	0.005	0.067	7th
Bengal	0.068	0.019	0.024	0.010	0.030	15th

Other

Line	Stuttgart	Rowher	Colt	Jackson Co.	Average	Rank
Francis	0.302	0.264	1.083	0.261	0.478	18th
Millie	0.312	0.653	0.714	0.272	0.488	17th
Jackson	0.337	0.683	0.881	0.270	0.543	11th
Cocodrie	1.069	1.029	0.900	0.557	0.889	2nd
Bengal	0.478	0.423	0.334	0.398	0.408	22nd

Linear

Line	Stuttgart	Rowher	Colt	Jackson Co.	Average	Rank
Francis	0.011	0.013	0.302	0.030	0.089	16th
Millie	0.028	0.017	0.102	0.038	0.046	22nd
Jackson	0.011	0.027	0.105	0.022	0.041	24th
Cocodrie	0.059	0.024	0.349	0.046	0.119	10th
Bengal	0.080	0.170	0.157	0.040	0.112	11th

Percentage, by weight, of damaged kernels in selected entries of Group 1 of the 2000 URRN.

(Rankings from highest value to lowest)

Rice Stink Bug

Line	Arkansas	Mississippi	Texas	Average	Rank
Francis	0.38	2.14	1.54	1.44	17th
Jefferson	0.49	2.21	2.04	1.68	14th
Maybelle	0.32	1.77	1.70	1.35	18th
Cocodrie	0.79	4.28	3.83	3.17	3rd
Dixiebelle	0.56	1.60	0.96	1.09	20th

Kernel Smut

Line	Arkansas	Mississippi	Texas	Average	Rank
Francis	0.009	0.002	0	0.0033	4th
Jefferson	0	0	0.005	0.0018	8th
Maybelle	0.005	0	0.001	0.0019	7th
Cocodrie	0.006	0	0.002	0.0023	6th
Dixiebelle	0	0	0.001	0.0005	13th

Other

Line	Arkansas	Mississippi	Texas	Average	Rank
Francis	0.34	0.42	0.61	0.47	19th
Jefferson	0.76	0.40	1.04	0.73	12th
Maybelle	0.75	0.34	0.50	0.51	18th
Cocodrie	1.23	1.01	2.26	1.52	2nd
Dixiebelle	0.88	0.29	0.57	0.55	16th

Linear

Line	Arkansas	Mississippi	Texas	Average	Rank
Francis	0.033	0.007	0.009	0.015	16th
Jefferson	0.016	0.001	0.009	0.008	20th
Maybelle	0.026	0.003	0.020	0.015	15th
Cocodrie	0.076	0.012	0.022	0.033	6th
Dixiebelle	0.019	0.004	0.009	0.009	19th

Summary

Discolored Kernels, Very Short Season ARPT, 2001 - Cross Co. only

Line	RSB	SMUT	OTHER	LINEAR
Francis	0.86	0.063	0.266	0
Bengal	3.47	0.018	0.905	0.145
Cocodrie	3.24	0.041	1.159	0.032
Earl	2.31	0.060	0.698	0.031
LaGrue	0.93	0.097	0.325	0.007
Ahrent	1.91	0.025	1.172	0.009
Orion	1.66	0.022	0.745	0.068

Discolored Kernels, Early Season ARPT, 2000

Line	RSB	SMUT	OTHER	LINEAR
Francis	0.49	0.141	0.191	0.019
Jefferson	0.52	0.103	0.454	0.021
Maybelle	0.65	0.169	0.317	0.025
Cocodrie	1.07	0.102	0.756	0.051
M202	1.58	0.044	2.415	0.217
Koshihakari	1.87	0.005	0.990	0.754
XL6	0.72	0.030	0.166	0.021

Discolored Kernels, Very Short Season ARPT, 1999

Line	RSB	SMUT	OTHER	LINEAR
Francis	1.87	0.065	0.478	0.089
Millie	1.64	0.024	0.488	0.046
Jackson	1.39	0.037	0.543	0.041
Cocodrie	1.90	0.067	0.889	0.119
Bengal	2.30	0.030	0.408	0.112

Discolored Kernels, Group 1 URRN, 2000

Line	RSB	SMUT	OTHER	LINEAR
Francis	1.44	0.0033	0.47	0.015
Jefferson	1.68	0.0018	0.73	0.008
Maybelle	1.35	0.0019	0.51	0.015
Cocodrie	3.17	0.0023	1.52	0.033
Dixiebelle	1.09	0.0005	0.55	0.009

Discolored Kernels, Group 5 URRN, 1999

Line	RSB	SMUT	OTHER	LINEAR
Francis	2.15	0.042	0.560	0
Rosemont	1.82	0.150	0.414	0.014
Cadet	2.28	0	2.359	0.022
L205	1.43	0.133	0.743	0.012

Straighthead

Straighthead is a physiological disorder which appears to be effected by the oxygen potential of the soil. Under certain conditions, arsenic levels can increase in these soils or on soils where cotton has been grown and MSMA or other arsenical pesticides have been applied. Straighthead may also occur in soils high in organic matter. Symptoms can only be detected after panicle emerge and fail to produce grain. Foliage tends to remain dark green. Rice grains may be distorted especially on long-grain varieties forming a parrot-beak on the end of the hull. Floral parts may also be missing and under sever conditions panicle fail to emerge from the boot.

STRAIGHT HEAD-Stuttgart.¹	2001 ²	2000 ³	1999 ³
Francis	6.8	6.5	6.0
Wells	7.2	6.8	7.0
LaGrue	8.2	7.5	7.0
Drew	6.8	6.8	7.0
Cocodrie	8.9	9.0	9.0
ZHE 733	1.0	2.0	2.0

¹ Based on a scale of 0 to 9 where 0 = no symptoms and
9 = no grain formation.

Rating Scale:

0 = no damage

1 = 81-90% grain develop

2 = 71-80% grain develop & 96-100% panicles broken from vertical

3 = 61-80% grain develop & 91-95% panicles broken from vertical

4 = 41-60% grain develop & 61-90% panicles broken from vertical

5 = 21-40% grain develop & 31-60% panicles broken from vertical - initial appearance of parrot-beak distortion

6 = 11-20% grain develop & 10-30% panicles broken from vertical

7 = panicles emerged but totally up wright; only 0-10% grain develop

8 = 0-10% panicle emergence, no seed produced

9 = no panicles

² Avg. of 6 reps.

³ Avg. of 4 reps.

RU9901081 Response to Nitrogen and DD50 threshold - Norman, R.J., C.E. Wilson, Jr., and N.A. Slaton.

Table . Influence of N application timing on grain yields of 'Francis' rice at three locations during 2001.

N Application Timing	Grain Yield		
	RREC	PTBS	SEREC
	bu/a		
SPF	172.7	205.4	163.0
2WS	170.5	188.6	179.0
LSD _(0.05)	8.5*	8.9*	8.1*
C.V.(%)	8.0	7.3	8.4

File Copy

200300066

Policy and Management Guidelines

PMGS-95-1

ATTACHMENT 1

Arkansas Agricultural Experiment Station

APPROVAL FORM FOR RELEASE OF PLANT MATERIALS

Distribution Following Final Action:
 Within Assoc. VP-Res. Office
 Casualty Unit Head
 (Indicated - PMRC Chairman)

INSTRUCTIONS: Submit typed approval form, along with plant materials proposed, to Unit Head (UH). UH will forward approved proposals to the Plant Materials Release Committee (PMRC) who will recommend approval or disapproval to AARS Assoc. VP-Research. Upon decision the packet is returned to PMRC, who will distribute documents to appropriate agencies, UH and PMRC secretary. An approved packet will be retained in AARS as a file; the disapproved packet will be returned to UH who will deliver it to the scientist.

Department Rice Res. & Ext. Center AAES (Scientist(s): Moldenhauer, KAK; Gibbons, J; Lee, FN;
Burnhardt, J; Norman, RJ; Wilson, CE; Cartwright, R

Common and Scientific Name: Rice, Orzya Sativa

Experimental Designation: RU9901081

Suggested Name(s): Francis

Type of Release Proposed (Check all applicable categories): Germplasm ☐ Parental Line ☐

Commercial Cultivar ☒ Unrestricted Public ☐ Restricted ☐ PVPA or Patent Protection ☒

Cooperating Agency(ies) & Scientist(s):

Departmental Approval:

[Signature] Moldenhauer 12/14/01
 Lead Scientist Date
[Signature] Moldenhauer 12/14/01
 Unit Head Date

Plant Materials Release Committee Recommendation: Approve ☒ Disapprove ☐ Conditional ☐

Recommended Name: As proposed

Comments:

[Signature] [Signature] 1/7/02
 PMRC Chairman Date

Comments:

Permission to release information to public: Yes ☒ No ☐ Exception ☐

Date on or after which information may be publically released:

If exception, please explain:

[Signature] 12/2/02
 Associate Vice President-Research of AARS Date

EXHIBIT D

**U.S. DEPARTMENT OF AGRICULTURE
PLANT VARIETY PROTECTION OFFICE, AMS, USDA
NATIONAL AGRICULTURE LIBRARY BLDG., Rm. 500
10301 BALTIMORE BLVD.
BELTSVILLE, MD 20705**

ADDITIONAL DESCRIPTION OF THE VARIETY

1. Approval Form For Release of Plant Materials, University of Arkansas.
2. Data on New Variety for Certification
3. Registration of Parent Crop Cultivars (Lebonnet, Dawn, Starbonnet, Lagrue)

DATA ON NEW VARIETY FOR CERTIFICATION

1. Variety name or temporary designation: Francis (RU9901081) - Long-grain rice *Poaceae Oryza Oryza sativa* L.
(Variety - Kind)
2. By whom selection was made Karen A.K. Moldenhauer, University of Arkansas Rice Research and Extension Center.
(Breeder) (Applicant or Sponsor's Name & Address)
P.O. Box 351, Stuttgart, AR 72160
3. Cross from which first selected 'Lebonnet'/CI9902/3/'Dawn'/CI9695/'Starbonnet'/4/'LaGrue' (cross no.19930887)
4. Location and year of selection Rice Res. & Ext. Ctr., Stuttgart, AR - 1996
5. Number of years tested and location of test(s) 1999-2000, at Stuttgart, AR; Crowley, LA; Beaumont, TX; and Stoneville MS
6. Breeding procedure used in its development: Hybridization, combination of modified pedigree and bulk breeding methods
7. Area(s) of adaptation Southern U.S. rice growing region
8. Procedure for maintaining Stock Seed Classes and number of generations variety may be multiplied Headrow, Breeder and foundation seed will be maintained at the University of Arkansas Rice research & Extension Center, P.O. Box 351, Stuttgart, AR 72160
9. Description of the manner in which the variety is constituted when a particular cycle of reproduction or multiplication is specified Not Applicable
10. Additional restrictions on the variety, specified by the breeder, with respect to geographic area of seed production, age of stand, or other factor affecting genetic purity Not Applicable
11. Enclosed with Breeder's Description a representative seed sample of the variety? yes ☒ no
12. Will an application be made to the Plant Variety Protection Office? ☒ yes no undecided
13. Will the application specify the variety to be sold only as a class of certified seed (Title V Option)? yes ☒ no
14. Will the application specify the variety be limited as to the number of generations? yes ☒ no
15. If "YES" which classes of production beyond Breeder Seed? Foundation Registered Certified

SIGNED _____ DATE _____

(OVER)

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200300066

16. Distinguishing Characteristics of Morphology and Physiology:

A. RICE

1. Grain type: 1 1. Long 2. Medium 3. Short
2. Plant height: 100 cm (range 95 - 127 cm)
3. Maturity-Days to Heading (Seeding to 50% heading) approximately 84
4. Plant color at booting 2 - 5 1. Pale green 2. Green 3. Light Olive Green 4. Olive Green
5. Dark Green
5. Plant Type (culm angle, degrees from perpendicular after flowering) 1 1. Erect (<30°)
2. Intermediate (about 45°)
3. Open (about 60°)
6. FLAGLEAF (after heading):
 - a. Pubescence 1 1. Glabrous 2. Intermediate 3. Pubescent
 - b. Leaf Angle 1 - 3 1. Erect 3. Intermediate 5. Horizontal 7. Descending
 - c. Blade Color 2 - 4 1. Pale green 2. Green 3. Olive Green 4. Dark green
5. Purple tips 6. Purple margins 7. Purple blotch 8. Purple
7. PANICLE:
 - a. Length 22.6 cm (range 18.5 to 27 cm)
 - b. Type 5 1. Compact 5. Intermediate 9. Open
 - c. Exsertion 2 1. Well 2. Moderately well 3. Just exserted 4. Partly exserted
5. Enclosed
 - d. Axis 2 1. Straight 2. Droopy
 - e. Shattering 3 1. Very low (<1%) 3. Low (1-5%) 5. Moderate (6-25%)
7. Moderately high (26-50%) 9. High (>50%)
8. GRAIN (Spikelet):
 - a. Awns 0 - 1 0. Absent 1. Tip awns at high fertility
3. Short and partly awned 5. Short and fully
7. Long and partly awned 9. Long and fully awned
 - b. Apiculus color 2 - 3 1. White 2. Straw 3. Brown (tawny) 4. Red 5. Red apex
6. Purple 7. Purple apex
 - c. Stigma Color 1 1. White 2. Light Green 3. Yellow 4. Purple

- d. Lemma and Palea Color 0
- | | |
|-----------------------------------|------------------------------------|
| 0. Straw | 1. Gold &/or gold furrows on straw |
| 2. Brown spots on straw (piebald) | 3. Brown furrow on straw |
| 4. Brown (tawny) | 5. Reddish to light purple |
| 6. Purple spots on straw | 7. Purple furrows on straw |
| 8. Purple | 9. Black |
| 10. White | |

- e. Lemma and Palea Pubescence 1
- | | |
|---------------------------|------------------------|
| 1. Glabrous | 2. Hairs on lemma keel |
| 3. Hairs on upper portion | 4. Short hairs |
| 5. Long hairs (velvety) | |

9. GRAIN (Seed):

- a. Seed Coat (bran) Color 2
- | | | |
|-----------|----------------|--------------------|
| 1. White | 2. Light brown | 3. Speckled brown |
| 4. Brown | 5. Red | 6. Variable purple |
| 7. Purple | | |

- b. Scent (Aroma) 0
- | | | |
|---------------|--------------------|------------|
| 0. Nonscented | 1. Lightly scented | 2. Scented |
|---------------|--------------------|------------|

- c. Seed Size 22.7 (gms/1000 seeds)

- d. Shape Class
- | | | | |
|-----------------|---------------------------|----------------------------|--------------------------|
| Paddy <u>3</u> | 1. Short (2.2:1 and less) | 2. Medium (2.3:1 to 3.3:1) | 3. Long (3.4:1 and more) |
| Brown <u>3</u> | 1. Short (2.0:1 and less) | 2. Medium (2.1:1 to 3.0:1) | 3. Long (3.1:1 and more) |
| Milled <u>3</u> | 1. Short (1.9:1 and less) | 2. Medium (2.0:1 to 2.9:1) | 3. Long (3.0:1 and more) |

17. Disease Reactions-include all diseases tested for (Susceptible or Resistant) On a scale of 0 = immune, 9 = maximum disease, Preliminary ratings for Francis indicate a 6-7 for sheath blight (Rhizoctonia solani Kuhn) and the following ratings for rice blast (Pyricularia grisea) races IG-1 = 3, IH = 1, IC-17 = 6, IB-49 = 6, IB-45 = 5, IB-1 = 4, IB1J=4, IB-54 =6, IB-17=5, IE-1 = 5, IE-1k = 6,

18. Describe the number per pound and/or percentage and kinds of variants, eg. height, pubescence, grain length, hull color, etc. The original release of foundation may contain the following in any combination: taller, shorter, earlier, later, glabrous or pubescent plants, as well as intermediate or long-grains and grains with long awns. Other atypical plants may still be encountered in the variety. The total variants and/or off-types numbered less than 1 per 5000 plants.

Vol. 34

REGISTRATION OF CULTIVARS

Registration of 'Adair' Rice

'Adair' rice (*Oryza sativa* L.) (Reg. no. CV-95, PI 568890) is an early-maturing, high-yielding, long-grain cultivar developed cooperatively by the Arkansas Agricultural Experiment Station and the USDA-ARS. Adair was officially released in 1993 by the Agricultural Experiment Stations of the University of Arkansas, University of Florida, Louisiana State University, Mississippi State University, Texas A&M University, and the USDA-ARS.

Adair was named in memory of Charles Roy Adair, a pioneering USDA-ARS rice breeder located at the Rice Branch Experiment Station at Stuttgart, AR, from 1931 to 1953.

Adair originated from the cross 'L-201'/'RU7402003' made by J.N. Rutger at Davis, CA, in 1978. L-201 has shown tolerance to sheath blight (caused by *Rhizoctonia solani* Kühn) when grown in the southern USA (1). RU7402003 (unknown off-type/3/CI 9439/'Bluebonnet'/PI 184675) is an early-maturing, short-statured, high-yielding, long-grain experimental line developed at Crowley, LA. The experimental designation for early evaluation was STG85L9-112, starting from a bulk of the F₁ panicle row grown in 1985.

The principal reasons for releasing Adair are early maturity, high yield potential, and sheath blight tolerance. In 17 Arkansas Rice Performance Trials conducted from 1990 to 1992, Adair matured similarly to 'Alan' and 'Tebonnet' at 81, 80, and 82 d to 50% heading, respectively, but not as early as 'Maybelle', which matured in 77 d. Plant height for Adair (107 cm) was between that of Alan (100 cm) and Tebonnet (124 cm). Adair is more resistant to lodging than Tebonnet but less resistant than Alan. Grain yields at 120 g kg⁻¹ (12%) moisture content of Adair, Alan, Tebonnet, and Maybelle averaged 8268, 7638, 7488, and 7520 kg ha⁻¹, respectively. Milling yields (mg g⁻¹ whole kernel/mg g⁻¹ total milled rice) at 120 g kg⁻¹ moisture content for Adair, Alan, Tebonnet, and Maybelle averaged 553:706, 590:713, 603:720, and 557:717, respectively. Individual grain dimensions are given in Table 1.

Adair was tested in the Cooperative Uniform Regional Rice Nurseries (URRN) with the designation RU9001007. Tests were conducted in Arkansas, Louisiana, Mississippi, and Texas from 1990 to 1992. Grain yield (120 g kg⁻¹ moisture content) in the URRN for Adair, Alan, Tebonnet, and Maybelle averaged 7756, 6649, 6694, and 6597 kg ha⁻¹, respectively; milling

yields averaged 547:693, 570:697, 593:703, and 573:703, respectively.

Adair is moderately susceptible to rice blast [caused by *Pyricularia grisea* (Cooke) Sacc.] races IG-1, IH-1, IC-17, and IB-49, the predominant blast races in the southern USA. Adair is moderately tolerant to sheath blight, rating similarly to 'Katy'. It is susceptible to the physiological disorder straighthead and rates similarly to Tebonnet.

Plants of Adair have erect culms, erect leaves that tend to droop upon maturity, and glabrous lemma, palea, and leaf blades. The endosperm of Adair is nonglutinous, nonaromatic, and has a light brown pericarp. Results from the USDA-ARS Rice Quality Research Laboratory, Beaumont, TX, indicate that Adair has typical U.S. southern long-grain cooking and processing quality characteristics (2). Adair is characterized as a relatively high amylose-intermediate gelatinizing type, having an average apparent starch amylose content of 220 g kg⁻¹ and an average alkali (17 g kg⁻¹ KOH) spreading reaction of 3.5.

In 1991, an initial increase of 1200 panicle rows was grown at Stuttgart, AR. The panicle rows were rouged, and 100 phenotypically similar rows were selected for a family block increase, which was grown in 1992. A 4-ha foundation seed field was also grown in 1992 from a bulk of the remaining panicle rows grown in 1991. The foundation field of Adair was rouged several times throughout the growing season. A few taller, shorter, earlier and/or later plants as well as a possible intermediate grain and other off-type plants may still be encountered in the cultivar. The total variants and/or off-types numbered <1 per 5000 plants.

Breeder and foundation seed of Adair will be maintained by the University of Arkansas, Rice Research and Extension Center, P.O. Box 351, Stuttgart, AR 72160.

Plans are being made to apply for protection of Adair under Title V of the U.S. Plant Variety Protection Act.

K. A. GRAVOIS,* K. A. K. MOLDENHAUER, F. N. LEE, R. J. NORMAN, R. S. HELMS, B. R. WELLS, R. H. DILDAY, P. C. ROHMAN, AND M. M. BLOCKER (3)

References and Notes

1. Tseng, S.T., H.L. Carnahan, C.W. Johnson, and D.M. Brandon. 1979. Registration of 'L-201' rice. *Crop Sci.* 29:745-746.
2. Webb, B.D., C.N. Bollich, H.L. Carnahan, K.A. Kuenzel, and K.S. McKenzie. 1985. Utilization characteristics and qualities of United States rice, p. 25-35. *In* Rice grain quality and marketing. IRRI, Manila, Philippines.
3. K.A. Gravois, K.A.K. Moldenhauer, F.N. Lee, R.J. Norman, R.S. Helms, P.C. Rohman, and M.M. Blocker, Univ. of Arkansas, Rice Res. and Ext. Ctr., P.O. Box 351, Stuttgart, AR 72160; B.R. Wells, Dep. of Agronomy, Univ. of Arkansas, Fayetteville, AR 72701; and R.H. Dilday, USDA-ARS, P.O. Box 287, Stuttgart, AR 72160. Research supported in part by funds from the Arkansas Rice Research and Promotion Board. Approved for publication by the director of the Arkansas Agric. Exp. Stn. Registration by CSSA. Accepted 31 Jan. 1994. *Corresponding author.

Published in *Crop Sci.* 34:1123 (1994).

Table 1. Rough, brown, and milled grain dimensions and weight of Adair, Alan, Tebonnet, and Maybelle grown in Arkansas from 1990 to 1992.

Cultivar	Class	Length (L)	Width (W)	Thickness	L/W ratio	Weight
		mm				mg
Adair	Rough	9.76	2.65	2.03	3.68	26.6
Adair	Brown	7.50	2.30	1.79	3.26	22.8
Adair	Milled	7.18	2.21	1.74	3.25	20.5
Alan	Rough	9.50	2.37	1.91	4.01	21.9
Alan	Brown	7.19	2.05	1.70	3.51	18.4
Alan	Milled	6.77	1.98	1.67	3.42	16.3
Tebonnet	Rough	9.43	2.49	1.93	3.79	23.5
Tebonnet	Brown	7.27	2.10	1.71	3.46	20.0
Tebonnet	Milled	6.84	2.01	1.65	3.40	18.1
Maybelle	Rough	9.21	2.55	1.95	3.61	23.9
Maybelle	Brown	7.01	2.12	1.74	3.31	20.6
Maybelle	Milled	6.84	2.07	1.72	3.30	18.2

Registration of 'LaGrue' Rice

'LaGrue' rice (*Oryza sativa* L.) (Reg. no. CV-96, PI 568891) is a very high-yielding, short-season, long-grain rice cultivar

developed cooperatively by the Arkansas Agricultural Experiment Station and the USDA-ARS. It was officially released in 1993 by the Agricultural Experiment Stations of the University of Arkansas, University of Florida, Louisiana State University, Mississippi State University, University of Missouri, Texas A&M University, and by the USDA-ARS.

LaGrue originated from the cross 'Bonnet 73'/'Nova 76'/'Bonnet 73/3'/'Newrex' (cross no. 85103) made at the Rice Research and Extension Center, Stuttgart, AR, in 1985. Bonnet 73 (2) and Nova 76 (3) were developed by the Arkansas Agricultural Experiment Station. Newrex (1) was developed by the Texas Agricultural Experiment Station and the USDA-ARS. The experimental designation for early evaluation was STG87P38-111, starting with a bulk of F₂ seed from the 1987 panicle row P38-111. LaGrue was tested in the Arkansas Rice Performance Trials (ARPT) and the Cooperative Uniform Regional Rice Nursery (URRN), 1990 to 1992, as entry RU9001096.

LaGrue is similar in maturity to 'Lebonnet', approximately 4 d later in maturity than 'Tebonnet', and 4 d earlier than 'Newbonnet'. LaGrue is a short-statured cultivar with an average plant height of 108 cm compared with Tebonnet at 124 cm. On a relative straw strength scale (0 = very strong straw, 9 = very weak straw) LaGrue, Newbonnet, 'Katy', and Tebonnet rated 2, 2, 3, and 6, respectively.

Rough rice grain yields of LaGrue have consistently exceeded 8200 kg ha⁻¹ (120 g kg⁻¹ [12%] moisture content) in Arkansas tests. In 13 ARPT and Elite tests (1990-1992), LaGrue, Tebonnet, 'Orion' and 'Mars' yielded 8873, 7785, 8577, and 8362 kg ha⁻¹, respectively. Orion and Mars, two medium-grain cultivars, would generally be expected to yield more than long-grain cultivars. Data from 21 Arkansas tests and URRN tests conducted in Arkansas, Louisiana, Mississippi, and Texas from 1990 to 1992 showed that LaGrue's average grain yield, 8385 kg ha⁻¹, compared favorably with those of Orion at 8182 and Mars at 7954 kg ha⁻¹.

LaGrue is susceptible to the blast fungus [caused by *Pyricularia grisea* (Cooke) Sacc.] races IG-1, IH-1, IC-17, and IB-49, rating 6, 5, 7 and 6, respectively, on a disease scale of 0 = immune, 9 = maximum disease. LaGrue is moderately susceptible to sheath blight (caused by *Rhizoctonia solani* Kühn), rating 6, the same as 'Millie', and Newbonnet. LaGrue is moderately susceptible to the physiological disorder, straighthead, rating 5, like 'Alan', Katy, and Orion.

Plants of LaGrue have erect culms, dark green erect leaves, and glabrous lemma, palea, and leaf blades. The lemma and palea are straw colored with colorless to straw colored apiculi and awns up to 2.5 cm on the lemma at maturity. Milling yields (mg g⁻¹ whole kernel/mg g⁻¹ total milled rice) at 120 g kg⁻¹ moisture from 10 similar regional and Arkansas tests (1990-1992) for LaGrue, Tebonnet, Alan, and Millie, averaged 600:714, 618:721, 603:712, and 651:720, respectively. Individual kernel dimensions for LaGrue, Tebonnet, Alan, Millie, 'Lacassine', and Newbonnet are shown in Table 1.

The endosperm of LaGrue is nonglutinous, nonaromatic, and covered by a light brown pericarp. Results from the USDA-ARS Rice Quality Research Laboratory at Beaumont, TX, indicate that LaGrue has typical southern U.S. long-grain rice cooking quality characteristics as described by Webb et al. (4). LaGrue has an average apparent starch amylose content of 226 g kg⁻¹ and an intermediate gelatinization temperature (70-75°C), as indicated by an average alkali (17 g kg⁻¹ KOH) spreading reaction of 3.8.

The foundation seed field of LaGrue was rogued several times throughout the season. The variants and/or off-types that may be found include any combination of the following: taller, shorter, earlier, later, lighter green, and/or pubescent plants, as

Table 1. Average rough, brown, and milled individual grain dimension and weight of LaGrue, Tebonnet, Alan, Millie, Lacassine, and Newbonnet rice grown in Arkansas.

Cultivar	Class	Length (L)	Width (W)	Thickness	L/W ratio	Weight
		mm				mg
LaGrue	Rough	9.36	2.58	1.96	3.63	25.1
Tebonnet	Rough	9.43	2.49	1.93	3.79	23.5
Alan	Rough	9.50	2.37	1.91	4.01	21.9
Millie	Rough	9.88	2.56	1.97	3.86	26.7
Lacassine	Rough	9.30	2.56	1.96	3.63	24.8
Newbonnet	Rough	9.44	2.46	1.93	3.84	23.3
LaGrue	Brown	7.43	2.21	1.77	3.36	21.0
Tebonnet	Brown	7.27	2.10	1.71	3.46	20.0
Alan	Brown	7.19	2.05	1.70	3.51	18.4
Millie	Brown	7.50	2.23	1.73	3.36	22.2
Lacassine	Brown	7.27	2.24	1.74	3.25	20.9
Newbonnet	Brown	7.34	2.13	1.71	3.45	18.9
LaGrue	Milled	7.07	2.13	1.70	3.32	19.0
Tebonnet	Milled	6.84	2.01	1.65	3.40	18.1
Alan	Milled	6.77	1.98	1.67	3.42	16.3
Millie	Milled	7.16	2.17	1.70	3.30	19.9
Lacassine	Milled	7.07	2.15	1.69	3.29	18.7
Newbonnet	Milled	7.15	2.06	1.66	3.47	18.1

well as plants with an occasional intermediate grain, very-long grain or purple apiculi. Other atypical plants may still be encountered in the cultivar. The total variants and/or off-types numbered <1 per 5000 plants.

Breeder and foundation seed of LaGrue will be maintained by the University of Arkansas Rice Research and Extension Center, P.O. Box 351, Stuttgart, AR 72160.

Plans are being made to submit application for registration and variety protection of LaGrue under the U.S. Plant Variety Protection Act (P.L. 91-577) with the certification option.

K. A. K. MOLDENHAUER,* K. A. GRAVOIS, F. N. LEE, R. J. NORMAN, J. L. BERNHARDT, B. R. WELLS, R. S. HELMS, R. H. DILDAY, P. C. ROHMAN, AND M. M. BLOCKER (5)

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Published in *Crop Sci.* 34:1123-1124 (1994).

Registration of 'Southshore' Creeping Bentgrass

'Southshore' creeping bentgrass (*Agrostis palustris* Huds.) (Reg. no. CV-5, PI 562385) was developed by Lofts Seed, Inc., Bound Brook, NJ, and released in August 1992. Germplasm

produced 27 tons DM/ha per year of palatable leguminous forage, the leaf meal averaging 26% protein. It greatly outyielded the common tropical strains.

When felled regularly at monthly intervals, the mimosaecous leaflets of K8 decayed rapidly under irrigation, returning up to a ton of N/ha per year. Intercropping experiments with corn and *Leucaena* suggest that a significant use in the tropics could be as a nitrogen-nurse crop for intercropped cereals.

Seeds have been distributed (as 'K8') since 1970 for increase throughout the tropics. Breeder seed is maintained by the Univ. of Hawaii Agric. Exp. Stn. Detailed information on K8 was published in Hawaii Agric. Exp. Stn. Res. Bull. 166 in 1972, and in Miscellaneous Paper 129 of the College of Tropical Agric., Univ. of Hawaii, Honolulu, HI 96822.

REGISTRATION OF ABARR PROSO MILLET¹ (Reg. No. 36)

Greg Hinze and H. O. Mann²

'Abarr' proso millet (*Panicum miliaceum* L.) traces to a single plant selection made in 1970 in a commercial field of "common white proso." Common white is a widely grown, well-adapted land variety of heterogeneous types.

Abarr is early in maturity. It matures more evenly than the bulk population from which it was selected, but not enough to permit direct combine harvest. It also is relatively upright in growth habit and has few of the axillary tillers found in many of the common white selections.

The panicle of Abarr is of the *contractum* or "one-sided" type. Seeds are large for the species and white in color. Grain yield has exceeded commercially available common white proso by an average of 325 kg/ha (290 lb or 5.2 bu/A) for 2 years at two locations in eastern Colorado.

The increase of Abarr is limited to one generation each of foundation, registered, and certified seed. Breeder seed will be maintained by the Dep. of Agronomy, Colorado State Univ., Ft. Collins, CO 80523. Abarr will be released Jan. 1, 1976.

¹Supported by the Colorado State Univ. Exp. Stn. and published as scientific series paper no. 1954. Received July 16, 1975.

²Associate professors of agronomy, Colorado Agric. Exp. Stn., located at US Central Great Plains Exp. Stn., Akron, and South-eastern Colorado Research Center, Springfield, respectively.

REGISTRATION OF BUTTE FOXTAIL MILLET¹ (Reg. No. 37)

Greg Hinze and Jerl Hamilton²

'Butte' foxtail millet (*Setaria italica* (L.) Beau.) is a bulk selection of Plant Introduction 315-088, introduced from the USSR where it is identified as the variety Harkovakaja. It is being released as a head ("spray") type for the birdseed industry of northeastern Colorado. In tests, caged birds have shown a decided preference for heads of Butte over heads of other varieties adapted to the region.

Butte is slightly earlier in maturity than the Golden German variety, and is slightly shorter averaging 76 to 102 cm (30 to 40 inches) in height. Plants become tinged with purple during maturity. Heads are long, tapering, relatively small in diameter, and moderately lobed. Bristles are short, ranging from 3 to 8 mm.

The increase of Butte is limited to one generation each of foundation, registered, and certified seed. Breeder seed will be maintained by the Dep. of Agronomy, Colorado State Univ., Ft. Collins, CO 80523. Butte will be released Jan. 1, 1976.

¹Supported by the Colorado State Univ. Exp. Stn. and published as scientific series paper no. 1955. Received 16 July, 1975.

²Associate professor of agronomy, US Central Great Plains Field Stn., Akron, Colo., and former manager, Washington County Grain Co., Otis, Colo., respectively.

REGISTRATION OF LEBONNET RICE¹ (Reg. No. 42)

C. N. Bollich, B. D. Webb, J. E. Scott, and J. G. Atkins²

'LEBONNET' (*Oryza sativa* L.), CI 9882, is a very early maturing long-grain rice variety developed at the Texas A&M Univ. Agric. Research and Extension Center at Beaumont, Texas, by the ARS-USDA, in cooperation with the Texas Agric. Exp. Stn. and the Texas Rice Improvement Association. It was officially released on January 28, 1974.

Lebonnet was developed from the cross 'Bluebelle'/'Belle Patna'/'Dawn', Beaumont cross B6616A, made in 1966. The spikelet of Lebonnet is straw colored, glabrous, and awnless and has a colorless apiculus. The combination of a straw-colored hull and colorless apiculus distinguishes Lebonnet grains from those of all other commercial long-grain varieties currently grown in the U.S. The milled kernel of Lebonnet is larger than that of any other U.S. long-grain variety grown in the South, on the average. Large grain size was one of the principal characteristics emphasized in the development of Lebonnet because of the preference in prime export markets for a larger size in long-grain rice. In the Uniform Rice Performance Nursery in Texas, Louisiana, Arkansas, and Mississippi during the 3-year period 1971-1973, the milled kernels of Lebonnet averaged 7.28 mm long and 2.12 mm wide, compared with corresponding measurements of 7.14 and 2.08 for Bluebelle, 7.02 and 2.03 for Belle Patna, 6.74 and 1.98 for 'Labelle', 7.01 and 1.96 for Dawn, 6.81 and 2.00 for 'Starbonnet', and 6.68 and 1.96 for 'Bonnet 73'.

Lebonnet closely resembles Bluebelle in plant height and maturity, and at heading, the flag leaves of both varieties tend to be upright. In contrast, Labelle and Belle Patna have flag leaves that tend to be horizontal or drooping. Lebonnet appears to be somewhat more leafy than Bluebelle. Lebonnet is relatively nonsensitive to photoperiod.

Lebonnet, like Dawn and Labelle, is resistant to *Pyricularia oryzae* Cav. races IB-54, IH-1, ID-13, IB-1, and IB-5 and susceptible to IB-49 and IC-17. Lebonnet is resistant to straight-head, a physiologic disease, and to white tip, caused by the foliar nematode *Aphelenchoides besseyi* Christie. It is susceptible to kernel smut, *Neovossia barclayana* Brefeld. Lebonnet is probably susceptible to common leaf sheath, and stem diseases that occur in rice in the southern U.S.

The first-crop yielding ability of Lebonnet appears to be about the same as that of Bluebelle. Limited data suggest that the second-crop yielding ability of Lebonnet is equal to that of Labelle or Belle Patna and superior to that of Bluebelle. Lebonnet is probably equal to Bluebelle and superior to Labelle and Belle Patna in lodging resistance.

In respect to milling yields and cooking and processing qualities, Lebonnet is comparable to present long-grain commercial varieties grown in the southern U.S. It is characterized as a relatively high amylose (24 to 25%) - intermediate gelatinizing (70 to 75 C) type.

The initial foundation seed of Lebonnet contained about 77 gold-hulled off-types per kilogram, an occasional grain with purple apiculus and a trace of other off-types. These off-types will be eliminated routinely through use of head rows in breeder seed purification and increase.

Application is not being made for protection of Lebonnet under the Plant Variety Protection Act. Breeder and foundation seed of Lebonnet will be maintained by the Texas A&M Univ. Agric. Res. and Ext. Cen. at Beaumont, Texas. Other information on Lebonnet has been published.³

¹Registered by the Crop Science Society of America. Cooperative investigations, ARS-USDA; Texas A&M Univ. Agric. Research and Extension Center of the Texas Agric. Exp. Stn.; and the Texas Rice Improvement Association. Received July 12, 1975.

²Research agronomist and research chemist, ARS-USDA; research associate, Texas Agric. Exp. Stn.; and research plant pathologist (Deceased), ARS-USDA respectively, Texas A&M Univ. Agric. Research and Extension Center, Beaumont, TX 77706.

³Bollich, C. N., B. D. Webb, J. E. Scott, and J. G. Atkins. 1974. Lebonnet Rice (CI 9882). Rice J. 77(4):16-21.

REGISTRATION OF NOVA 66 RICE¹ (Reg. No. 30)

T. H. Johnston, G. E. Templeton, and J. G. Atkins²

'NOVA 66' rice (*Oryza sativa* L.), C. I. 9481, Stg 582114, originated as a single plant selection from 'Nova' (C.I. 9459) made at Stuttgart, Arkansas, in 1957. In preliminary tests it showed shorter and stiffer straw than Nova.

Nova 66 is a short-season, smooth-hulled, high-yielding, medium-grain variety released for general production in Arkansas.³ It is very similar to Nova in most characteristics but has slightly shorter straw and matures about a day later, on the average.

Nova 66 was evaluated in regional uniform tests, beginning in 1961, by the Crops Research Division and cooperating agricultural experiment stations in Arkansas, Louisiana, Mississippi, and Texas. It was tested extensively in Arkansas during the period 1961 through 1965. In 31 replicated tests in which differential lodging occurred, Nova 66 showed much stiffer straw than Nova and considerably stiffer straw than Nato, the leading medium-grain variety. Under conditions of very severe lodging, Nova 66 usually has lodged about 20 to 25 cm above the ground and still could be combine-harvested readily. In contrast, 'Nato' has lodged near the soil surface, making combine harvesting much slower and more difficult.

In order to obtain the full benefit from the lodging resistance and high yielding potential of Nova 66, use of the proper rate and timing of midseason application of nitrogen is very important. The combination of highest grain yield, near minimum plant height, and minimum lodging, was obtained when half of the topdress nitrogen was applied just prior to first flood, and half at about 67 days after seedling emergence when about half of the longest internodes of the main culms measured 25 to 40 mm.

Nova 66, like Nova, shows a high degree of field resistance to rotten-neck blast (*Piricularia oryzae* Cav.) in Arkansas but may be damaged by a race of the blast fungus which is present in Louisiana and Texas. In the absence of blast, Nova 66 has performed very well in Louisiana and Texas tests. Nova 66 is moderately resistant to straighthead and is resistant to hoja blanca.

Numerous detailed cooperative evaluation tests indicate that Nova 66 is very similar to Nova, Nato, and Saturn in processing and cooking characteristics. Nova 66 may require more care in handling and drying than Nato in order to obtain maximum head rice (milling) yields.

Nova 66 was developed cooperatively by the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture and the Arkansas Agricultural Experiment Station. Foundation seed was released to growers in the spring of 1966. The University of Arkansas Rice Branch Experiment Station, Stuttgart, will maintain breeder seed.

¹ Registered by the Crop Science Society of America. Received March 6, 1968. Cooperative investigations of the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, and the Arkansas Agricultural Experiment Station.

² Research Agronomist, Crops Research Division, ARS, USDA, Stuttgart, Ark. 72160; Plant Pathologist, Arkansas Agricultural Experiment Station, Fayetteville; and Research Plant Pathologist, Crops Research Division, ARS, USDA, Beaumont, Texas.

³ Johnston, T. H., G. E. Templeton, J. L. Sims, V. L. Hall, and K. O. Evans. 1966. Performance in Arkansas of Nova 66 and other medium-grain rice varieties, 1960 to 1965. Arkansas Agr. Exp. Sta. Rept. Series 148. 24 p.

REGISTRATION OF STARBONNET RICE¹ (Reg. No. 31)

T. H. Johnston, B. D. Webb, and K. O. Evans²

'STARBONNET' rice (*Oryza sativa* L.), C.I. 9584, Stg 604619, was selected in 1960 from the F₂ generation of a cross made at Stuttgart, Arkansas, in 1954 between 'Century Patna 231' (C. I. 8993) and 'Bluebonnet' (C. I. 8322).³ The final selection

was based on desirable agronomic type¹ and acceptable long-grain-quality milled rice. Starbonnet is a midseason, short-strawed, high-yielding, long-grain variety that was developed and released cooperatively by the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture and the Arkansas Agricultural Experiment Station.

Starbonnet was evaluated in uniform regional tests beginning in 1964 by the Crops Research Division and cooperating agricultural experiment stations in Arkansas, Louisiana, Mississippi, and Texas. Foundation seed of Starbonnet was distributed from the University of Arkansas Rice Branch Experiment Station, Stuttgart, in 1967.

Compared to 'Bluebonnet 50' growing under similar conditions, plants of Starbonnet appear to produce more tillers; usually have narrower and shorter leaves; average 8 days earlier in heading; produce panicles that are more compact and less drooping; have culms (stems) with considerably shorter basal internodes at maturity so they average 15% shorter in height; and are much more resistant to lodging.

Hulls (lemma and palea) of Starbonnet are smooth (glabrous), straw-colored with faint purple tips (apiculi), and usually are awnless. Under conditions highly favorable for vegetative growth, short awns may be produced on florets at the tips of the panicles. Grains of Starbonnet are slightly smaller than those of Bluebonnet 50.

Starbonnet has produced considerably higher grain and head rice yields than Bluebonnet 50, the predominant long-grain variety now grown in Arkansas. Based on results from 26 replicated tests in Arkansas during the 5-year period 1962 through 1966, the estimated per-acre value of milled rice from Starbonnet was 9% greater than from Bluebonnet 50.

Starbonnet is very similar to Bluebonnet 50 in reaction to diseases.

Numerous cooperative tests conducted at the Regional Rice Quality Laboratory at Beaumont, Texas, indicate that Starbonnet has cooking and processing characteristics very similar to those of Bluebonnet 50.

Breeder and foundation seed of Starbonnet will be maintained at the University of Arkansas Rice Branch Experiment Station, Stuttgart, Ark.

¹ Registered by the Crop Science Society of America. Received March 6, 1968. Cooperative investigations of the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, and the Arkansas Agricultural Experiment Station.

² Research Agronomist, Stuttgart, Ark. 72160, and Research Chemist, Beaumont, Texas, Crops Research Division, ARS, USDA; and Research Assistant, Arkansas Agricultural Experiment Station, Stuttgart, respectively.

³ Johnston, T. H., G. E. Templeton, B. D. Webb, J. L. Sims, B. R. Wells, V. L. Hall, and K. O. Evans, 1967. Performance in Arkansas of Starbonnet and other long-grain rice varieties, 1962 to 1966. Arkansas Agr. Exp. Sta. Rept. Series 160. 26 p.

REGISTRATION OF BLUEBELLE RICE¹ (Reg. No. 32)

C. N. Bollich, J. E. Scott, B. D. Webb, and J. G. Atkins²

'BLUEBELLE' rice (*Oryza sativa* L.), C.I. 9544, B575A1-57-5, is a lodging-resistant, high-yielding, very-early-maturing, long grain variety released by the Rice-Pasture Research and Extension Center, Beaumont, Texas, in the spring of 1965. Bluebell is a product of the cooperative varietal improvement program

¹ Registered by the Crop Science Society of America. Received March 6, 1968. Cooperative investigations of the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, the Rice-Pasture Research and Extension Center of the Texas Agricultural Experiment Station, and the Texas Rice Improvement Association.

² Research Agronomist, Crops Research Division, ARS, USDA, Beaumont, Texas 77706; Research Associate, Texas Agricultural Experiment Station; Research Chemist and Research Pathologist, Crops Research Division, ARS, USDA; respectively.

the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, the Texas Agricultural Experiment Station, and the Texas Rice Improvement Association. It was developed by H. M. Beachell¹ from the cross C.I. 9214 x 'Century Patna 231' x C.I. 9122 made at Beaumont in 1957. C.I. 9122 was derived from the cross Hill selection x 'Bluebonnet'. C.I. 9214 was a rogue from 'Rexark'. Bluebelle was derived from a bulked F₂ panicle row in 1959. In 1961 it was entered in uniform regional tests conducted by the Crops Research Division and cooperating experiment stations in Arkansas, Louisiana, Mississippi, and Texas.

Bluebelle grains are similar to those of 'Bluebonnet 50' and are larger in all three dimensions than those of 'Belle Patna'. The hulls are gold-colored, glabrous, and awnless, and have faint anthocyanin pigmentation in the apiculus. Bluebelle plants are shorter, sturdier, and of a darker green color than those of Belle Patna and the leaves are more erect. In Texas, Bluebelle matures about 1 week later than Belle Patna.

Bluebelle is superior to Belle Patna and Bluebonnet 50 in resistance to lodging and in yielding ability. In uniform yield tests at four locations over a 4-year period (a total of 16 tests), Bluebelle produced 18 and 12% higher grain yields than Belle Patna and Bluebonnet 50, respectively. When seeded sufficiently early, Bluebelle can be expected to produce second-crop yields about equal to those of Belle Patna. Bluebelle is similar to Belle Patna and Bluebonnet 50 in milling, cooking, and processing qualities.

Bluebelle is very similar to Belle Patna in reaction to diseases. It is susceptible to the prevalent races, IB-5, ID-8, and IC-1, of *Pyricularia oryzae* Cav. Bluebelle is moderately resistant to straighthead and is susceptible to hoja blanca, brown spot, narrow brown leaf spot, kernel smut, and leaf smut.

Breeder seed of Bluebelle will be maintained at the Rice-Pasture Research and Extension Center, Beaumont, Texas. Additional information on the performance of Bluebelle has been published.⁴

¹Formerly, Research Agronomist, Crops Research Division, ARS, USDA, now Plant Breeder, International Rice Research Institute, Manila, Philippines.

²Bollich, C.N., J.E. Scott, B.D. Webb, and J.G. Atkins. A lodging resistant, very early maturing, long grain rice variety released in Texas. Rice Journal 69(1):13-17. Jan. 1966.

REGISTRATION OF DAWN RICE¹

(Reg. No. 33)

C. N. Bollich, J. G. Atkins, J. E. Scott, and B. D. Webb²

'DAWN' rice (*Oryza sativa* L.), C.I. 9534, B505A1-28-7-1-2, is a blast-resistant, early maturing, long-grain variety developed at the Rice-Pasture Research and Extension Center, Beaumont, Texas, by the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture in cooperation with the Texas Agricultural Experiment Station and the Texas Rice Improvement Association. Simultaneous release of foundation seed was made to growers in the spring of 1966 by the Texas, Louisiana, and Arkansas Agricultural Experiment Stations.

Dawn was developed by H. M. Beachell³ from the cross 'Century Patna 231' x HO 12-1-1, made at Beaumont in 1950. HO 12-1-1 is a selection from the cross 'TP 49' x C.I. 9515. C.I. 9515 is from the cross 'Carolina Gold' x C.I. 5309 x ('Shoemed' x 'Fortuna'). In 1961, Dawn was entered in uniform regional tests conducted by the Crops Research Division and

cooperating experiment stations in Arkansas, Louisiana, Mississippi, and Texas.

Grains of Dawn are similar in size and shape to those of the Century Patna 231 parent. They are similar in length but slightly narrower than those of 'Bluebelle' and 'Belle Patna'. Hulls are gold-colored, glabrous, and awnless, and the apiculus is colorless. This latter characteristic differentiates Dawn from the other long-grain varieties grown in the U.S. Dawn matures about 2 weeks later than Bluebelle and about 2 weeks earlier than 'Bluebonnet 50'. Dawn plants are somewhat taller than those of Bluebelle but shorter than Bluebonnet 50; and Dawn is relatively resistant to lodging.

The outstanding characteristic of Dawn is its resistance to United States races of the blast disease fungus (*Pyricularia oryzae* Cav.) of rice. On the basis of greenhouse reaction tests with *P. oryzae* isolates from the United States, Dawn is rated as resistant to international races IB-5, IC-3, ID-1, IE-1, IG-1, IC-2, and IH-1 and intermediate to races IB-2 and IB-4. The most prevalent race of the blast fungus in the United States has been IG-1, followed by IB-5, IC-3, and ID-8. Dawn is moderately resistant to brown leaf spot. It is susceptible to straight-head, hoja blanca, bordered sheath spot, narrow brown leaf spot, and kernel smut. Reaction to stem rot, leaf smut, and white tip is undetermined.

In Texas, in the absence of blast, rough rice yields of Dawn and Belle Patna tend to be about equal, and below those of Bluebelle. In the presence of blast, Dawn can be expected to produce higher yields than any other long-grain variety. It is especially adapted to areas in Texas, Louisiana, and Arkansas where this disease occurs. Because of the longer growing period of Dawn, it is less suited to second-cropping than Bluebelle or Belle Patna.

Dawn is similar to Bluebelle, Belle Patna, and Bluebonnet 50 in head rice yield but it appears to be slightly lower in total milled rice yield. The cooking and processing qualities of Dawn compare favorably to those of Bluebelle, Belle Patna, and Bluebonnet 50.

Breeder and foundation seed of Dawn will be maintained at the Rice-Pasture Research and Extension Center, Beaumont, Texas. Additional information on the performance of Dawn in Texas, Louisiana, Arkansas, and Mississippi has been published.^{4,5,6,7}

¹Registered by the Crop Science Society of America. Received March 6, 1968. Cooperative investigations of the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, the Rice-Pasture Research and Extension Center of the Texas Agricultural Experiment Station, and the Texas Rice Improvement Association.

²Research Agronomist and Research Pathologist, Crops Research Division, ARS, USDA, Beaumont, Texas 77706; Research Associate, Texas Agricultural Experiment Station; and Research Chemist, Crops Research Division, ARS, USDA, respectively.

³Formerly Research Agronomist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture; now Plant Breeder, International Rice Research Institute, Manila, Philippines.

⁴Bollich, C. N., J. G. Atkins, J. E. Scott, and B. D. Webb. 1966. Dawn — A blast resistant, early maturing, long grain rice variety. Rice J. 69(4): 14, 16, 18, 20.

⁵Jodon, Nelson E., and Earl A. Sonnier. 1966. Dawn — Performance and seed production in Louisiana. Rice J. 69(4): 20, 22.

⁶Bowman, Donald H. 1966. Dawn — Its performance in Mississippi. Rice J. 69(4): 23.

⁷Johnston, T. H., G. E. Templeton, John L. Sims, V. L. Hall, and K. O. Evans. 1966. Dawn rice — Its performance in Arkansas. Rice J. 69(4): 26-28.

1999 Arkansas Rice Performance Trials (Stuttgart, Pine Tree, Rohwer, and Keiser)

VARIETY	YIELD (BU/AC)	HEIGHT (IN.)	MATURITY (50% HD)	KERNEL WT (mg)	MILLING HR:TOT
Francis	180	38	82	16.1	61:71
Ahrent	172	40	81	16.1	61:70
Wells	169	39	83	17.9	55:74
LaGrue	180	43	83	17.4	59:72
Kaybonnet	157	42	82	14.3	57:72
Drew	160	44	86	15.7	58:73
Cocodrie	162	37	81	16.6	65:73
Cypress	144	37	84	16.7	66:73
C.V. .05	17.7	4.8	6.6	8.3	15.6-2.8

2000 Arkansas rice Performance Trials (Stuttgart, Pine Tree, Jackson Co., and Missouri)

VARIETY	YIELD (BU/AC)	HEIGHT (IN.)	MATURITY (50% HD)	KERNEL WT (mg)	MILLING HR:TOT
Francis	188	39	86	16.9	66:73
Ahrent	155	40	85	17.6	64:71
Wells	181	41	87	19.1	61:74
LaGrue	168	43	89	17.2	62:71
Kaybonnet	149	43	88	14.6	65:72
Drew	144	43	90	16.1	64:73
Cocodrie	164	38	86	18.0	66:72
Cypress	142	35	90	17.8	68:72
C.V. .05	18.4	10.2	4.6	7.2	10.1-2.4

2001 Arkansas Rice Performance Trails (Stuttgart, Pine Tree, Cross Co., Rohwer, and Keiser)

VARIETY	YIELD (BU/AC)	HEIGHT (IN.)	MATURITY (50% HD)	KERNEL WT (mg)	MILLING HR:TOT
Francis	190	41	84	16.2	63:70
Ahrent	177	43	83	16.0	64:68
Wells	190	42	84	19.0	66:71
LaGrue	182	46	85	18.2	62:69
Kaybonnet	168	43	84	14.6	66:70
Drew	166	48	86	16.2	65:70
Cocodrie	181	40	83	18.1	67:71
Cypress	160	39	86	17.1	66:70
C.V. .05	15.6	11.0	6.8	10.7	10.0-2.4

Average of the 1999-2001 Arkansas Rice Performance Trials (14 Tests: Stuttgart (3), Pine Tree (3), Jackson Co. (1), Rohwer (3), Keiser (2) Cross County (1) and Missouri (1))

VARIETY	YIELD (BU/AC)	HEIGHT (IN.)	MATURITY (50% HD)	KERNEL WT (MG)	MILLING HR:TOT
Francis	186	39	84	16.5	63:71
Ahrent	171	41	83	16.5	63:70
Wells	181	41	85	18.8	60:73
LaGrue	176	44	86	17.8	61:71
Kaybonnet	159	43	84	14.7	63:71
Drew	162	45	87	16.1	62:72
Cocodrie	169	38	84	17.6	66:72
Cypress	148	37	87	17.4	67:72

1999 Arkansas Rice Performance Trials Means By Location

VARIETY	GRAIN YIELD (BU/AC)					HEAD RICE(%):TOTAL RICE(%)		
	RREC	PTES	SEBES	NEREC	AVE	RREC	SEBES	AVE
Francis	203	154	220	142	180	66:72	55:70	61:71
Ahrent	175	173	162	177	172	66:71	56:69	61:70
Wells	173	191	182	130	169	68:75	41:73	55:74
LaGrue	178	176	218	146	180	66:73	53:72	59:72
Kaybonnet	157	174	187	109	157	68:73	47:71	57:72
Drew	157	163	190	130	160	69:74	46:72	58:73
Cocodrie	176	175	185	110	162	69:74	62:72	65:73
Cypress	156	148	157	113	144	71:74	62:72	66:73
C.V. .05	7.9	14.5	13.7	17.0	17.7	5.7-2.1	16.7-1.9	15.6-2.8

2000 Arkansas Rice Performance Trials Means By Locations

VARIETY	GRAIN YIELD (BU/AC)						HEAD RICE(%):TOTAL RICE(%)			
	RREC	PTES	JC	SEBES	MO	AVE	RREC	JC	PTES	AVE
Francis	196	166	235	131	193	188	66:72	66:74	64:72	66:73
Ahrent	154	145	174	138	160	155	66:71	63:71	63:70	64:71
Wells	187	164	218	162	169	181	47:73	68:75	66:75	61:74
LaGrue	176	164	188	151	161	168	52:69	66:72	64:70	62:71
Kaybonnet	156	141	166	143	137	149	56:70	69:72	67:72	65:72
Drew	167	131	196	130	91	144	61:72	65:72	65:73	64:73
Cocodrie	162	147	187	145	161	159	65:70	66:73	67:72	66:72
Cypress	154	139	188	110	109	142	63:70	71:74	70:73	68:72
C.V. .05	10.0	10.4	14.8	14.8	18.4	18.4	7.8-2.1	7.9-2.0	4.3-1.7	10.1-2.4

2001 Arkansas Rice Performance Trials Means By Location

VARIETY	GRAIN YIELD (BU/AC)						HEAD RICE(%):TOTAL RICE(%)		
	RREC	PTES	CC	SE	NE	AVE	RREC	CC	AVE
Francis	193	201	173	208	177	190	62:69	65:71	63:70
Ahrent	176	192	163	179	168	176	62:67	65:68	64:68
Wells	198	193	187	193	179	190	63:71	69:72	66:71
LaGrue	202	187	168	158	176	178	61:68	64:70	62:69
Kaybonnet	164	185	169	167	153	168	63:69	69:71	66:70
Drew	151	174	136	199	171	166	62:68	67:72	65:70
Cocodrie	180	183	184	183	159	178	65:71	68:71	67:71
Cypress	173	175	163	133	154	160	64:69	68:71	66:70
C.V. .05	9.7	9.0	13.9	14.2	12.1	11.8	4.8-2.4	2.9-1.6	3.9-2.0

1999 Arkansas Uniform Regional Rice Nursery data

VARIETY	YIELD (BU/AC)	HEIGHT (IN.)	MATURITY (50% HD)	KERNEL WT (MG)	MILLING HR:TOT
Francis	211	39	87	17.9	61:72
Ahrent	165	41	88	16.3	62:71
Wells	182	44	88	18.7	60:72
LaGrue	180	50	88	18.2	61:71
Kaybonnet	181	41	85	14.8	58:70
Drew	182	44	88	16.3	60:70
Cocodrie	182	37	86	17.9	61:71
Cypress	173	37	88	17.4	64:71

2000 Arkansas Uniform Regional Rice Nursery data

VARIETY	YIELD (BU/AC)	HEIGHT (IN.)	MATURITY (50% HD)	KERNEL WT (MG)	MILLING HR:TOT
Francis	228	41	85	18.0	60:72
Ahrent	185	39	84	16.5	51:71
Wells	212	41	86	19.5	54:73
LaGrue	221	44	86	18.1	57:70
Kaybonnet	186	43	86	16.3	58:72
Drew	177	44	87	16.3	53:73
Cocodrie	203	37	86	18.2	60:72
Cypress	168	37	87	18.4	58:73

2001 Arkansas Regional Rice Nursery Data

VARIETY	YIELD (BU/AC)	HEIGHT (IN.)	MATURITY (50% HD)	KERNEL WT (MG)	MILLING HR:TOT
Francis	223	38	83	17.3	65:70
Ahrent	130	38	83	18.0	63:68
Wells	206	41	83	20.0	64:70
LaGrue	210	45	81	18.0	63:69
Kaybonnet	181	45	83	16.0	65:69
Drew	168	48	85	16.7	66:71
Cocodrie	193	37	80	19.3	63:70
Cypress	159	39	84	18.7	67:71

1999-2001 Arkansas Regional Rice Nursery data

VARIETY	YIELD (BU/AC)	HEIGHT (IN.)	MATURITY (50% HD)	KERNEL WT (MG)	MILLING HR:TOT
Francis	221	39	85	17.7	62:71
Ahrent	160	39	85	16.3	55:70
Wells	200	42	86	19.4	59:72
LaGrue	204	46	85	18.1	60:70
Kaybonnet	182	45	83	15.7	65:69
Drew	168	48	85	16.4	66:71
Cocodrie	193	37	84	18.5	61:71
Cypress	159	39	84	18.2	67:71

1999 Uniform Regional Rice Nursery Means by Location

VARIETY	GRAIN YIELD (BU/AC)					HEAD RICE(%):TOTAL RICE(%)				
	AR	LA	MS	TX	AVE	AR	LA	MS	TX	AVE
Francis	211	237	243	199	223	61:72	62:70	44:63	50:66	54:68
Ahrent	165	216	203	153	184	62:71	59:65	42:72	55:67	55:69
Wells	182	230	207	204	206	60:72	62:70	44:69	63:68	55:70
LaGrue	180	248	208	194	208	61:71	61:68	54:68	41:60	54:67
Kaybonnet	181	227	160	176	186	58:70	61:69	45:67	55:68	55:69
Drew	182	233	190	178	196	60:70	62:69	49:68	56:68	57:69
Cocodrie	182	240	174	177	193	61:71	60:67	68:73	57:68	62:70
Cypress	173	214	167	173	182	64:71	64:69	59:68	59:68	62:69

2000 Uniform Regional Rice Nursery Means by Location

VARIETY	GRAIN YIELD (BU/AC)					HEAD RICE(%):TOTAL RICE(%)				
	AR	LA	MS	TX	AVE	AR	LA	MS	TX	AVE
Francis	228	200	197	258	221	60:72	62:71	45:67	56:68	56:70
Ahrent	185	145	164	196	173	51:71	63:70	48:62	55:65	54:67
Wells	212	189	187	257	211	54:73	63:73	38:67	56:69	53:71
LaGrue	221	211	194	264	223	57:70	60:70	41:67	52:66	52:68
Kaybonnet	186	179	188	235	197	58:72	65:71	53:65	52:65	57:68
Drew	177	184	173	210	186	53:73	64:71	52:67	58:68	57:70
Cocodrie	203	181	195	227	202	60:72	64:70	51:65	59:68	59:69
Cypress	168	179	172	195	179	58:73	61:70	59:68	60:68	60:70

2001 Uniform Regional Rice Nursery Means by Location

VARIETY	GRAIN YIELD (BU/AC)					HEAD RICE(%):TOTAL RICE(%)			
	AR	LA	MS	TX	AVE	AR	LA	MS	AVE
Francis	223	183	198	246	213	65:70	62:70	54:69	60:70
Ahrent	130	172	156	184	161	63:68	65:70	46:64	58:67
Wells	206	163	189	207	191	64:70	59:70	44:67	56:69
LaGrue	210	175	183	188	189	63:69	60:69	49:64	57:67
Kaybonnet	181	146	138	218	171	65:69	65:70	59:68	63:69
Drew	168	168	151	200	172	65:71	63:69	54:66	61:69
Cocodrie	193	164	125	228	178	63:70	65:69	55:66	61:68
Cypress	159	153	137	201	163	67:71	68:71	54:65	63:69

1999-2001 Uniform Regional Rice Nursery Means by Location

VARIETY	GRAIN YIELD (BU/AC)					HEAD RICE(%):TOTAL RICE(%)				
	AR	LA	MS	TX	AVE	AR	LA	MS	TX*	AVE
Francis	221	207	213	249	223	62:71	62:70	48:66	60:70	58:69
Ahrent	160	178	174	194	177	55:70	62:68	45:66	58:67	55:68
Wells	200	194	194	224	203	59:72	61:71	42:68	56:69	55:70
LaGrue	204	211	195	220	208	60:70	60:70	48:66	57:67	56:68
Kaybonnet	182	184	184	204	189	65:69	64:70	52:67	63:69	61:69
Drew	168	195	171	200	184	66:71	63:70	52:67	61:69	61:69
Cocodrie	193	195	165	210	191	61:71	63:69	58:68	61:68	61:69
Cypress	159	182	159	188	172	67:71	64:70	57:67	63:69	63:69

* TX milling data for 1999 and 2000

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). The information is held confidential until the certificate is issued (7 U.S.C. 2426).

EXHIBIT E

STATEMENT OF THE BASIS OF OWNERSHIP

1. NAME OF APPLICANT(S) University of Arkansas Agricultural Experiment Station	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER RU9901081	3. VARIETY NAME FRANCIS
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country) AFLS Building Room E108 University of Arkansas Fayetteville, AR 72701 USA	5. TELEPHONE (include area code) 501-575-4446	6. FAX (include area code) 501-575-2401
7. PVPO NUMBER 200300066		

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. If no, please explain

☒ YES ☐ NO

9. Is the applicant (individual or company) a U.S. National or a U.S. based company? If no, give name of country

☒ YES ☐ NO

10. Is the applicant the original owner? ☒ YES ☐ NO If no, please answer one of the following:

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?

☐ YES ☐ NO If no, give name of country

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?

☐ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (If needed, use the reverse for extra space):

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 6 minutes per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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